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TABLE OF CONTENTS

The Biological Engineer 5

Beta Chapter of Phi Sigma 7

Botanical Field Work in Montana 19

Anti-Evolutionism 29

Editorials

Undergraduate Research and Phi Sigma 33

Relations between Faculty and Students 34

History of Phi Sigma Beta, (Chi) 35

Digest Philadelphia Convention 37

Scientific Papers and Abstracts 47

Insect Rearing Cage 51

Grist We Grind 52

Report of the National Treasurer 55

PHI SIGMA SOCIETY

AN ORGANIZATION DEVOTED TO THE PROMOTION OF INTEREST IN RESEARCH IN THE BIOLOGICAL SCIENCES
founded OHIO STATE UNIVERSITY, March 17, 1915.

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GEORGE H. CONANT (Wisconsin, 1924) former Director of the Botanical Division and Microscope Slide Department, General Biological Supply House is at present Assistant Professor of Botany, University of Pennsylvania. His work has carried him into a field in which all of us are deeply interested. Doctor Conant is proprietor of Triarch Botanical Products. We are very grateful to him for his contribution in this number.

* * *

CARL P. HUBER (Michigan State, '24), who masterly reviews biology on the campus at Ann Arbor in this issue, is a medical student and student assistant in Anatomy and Histology. His article is one which no one of us can well afford to miss. It is both entertaining and instructive.

* * *

PROFESSOR J. E. KIRKWOOD is head of the Department of Botany at the State University of Montana, a position which he has held for the last 17 years. He is interested especially in the problems of ecology and plant distribution of the northern Rocky Mountains and has spent considerable time in the study of flora in expeditions into the wildest and most remote portions, gathering plants, notes, and photographs in preparation for publication, especially on the distribution of the flora.

* * *

CLIFFORD H. FARR (Washington U. '25) an Associate Professor of Botany at the Henry Shaw School of Botany is a frequent contributor to the Atlantic Monthly. His articles, which usually embrace new ideas in the field of biological sciences can be enjoyed by every one. We believe you will find this one no exception, for Doctor Farr has abundant literature to work upon since the anti-evolutionist's views have received wide publicity from many and sundry sources within the last two years.

THE BIOLOGIST

VOLUME IX MAY, 1927 NO. 1

The Biological Engineer

(The Service of Supply)

By George H. Conant, Assistant Professor of Botany, University of Penn.

(Zeta '24)

THE task of supplying schools and colleges with the working materials for their biological laboratories is one of the youngest commercial enterprises. (This applies, of course, only to the supplying of actual plant and animal materials, since the production and distribution of biological laboratory equipment have been well developed for a number of years. Since the latter are concerned fundamentally with physical and chemical problems, however, they will not be considered in this discussion.) So immature is this profession, indeed, that its conceptions of such matters as ideals and aims are as yet unformulated. It is quite certain, however, that the field of biological supply presents important possibilities to young biologists, and will continue to do so increasingly in the future. Since the profession is thus at present in the formative stage, specific remarks would be meaningless, while general statements and opinions may have a clarifying and a stimulating influence.

Not many years ago it was considered one of the regular duties of teachers of botany and zoology to collect and prepare their own algae and alligators, their own microscope slides and museum pieces. Now trustees and teachers alike are coming to realize that the instructor has duties of greater importance and of perhaps more immediate concern than the preparation of laboratory materials. They are beginning to believe that such materials may be prepared with a smaller outlay of time and money than is being devoted to them in the home laboratory. They are ready to be convinced, moreover, that not all things coming from the school laboratory are perfect, and that not all products of the commercial laboratory are justly condemned unseen. The present day teacher is looking forward with eager anticipation to the time when he can purchase his plants and animals as he buys apparatus and chemicals. Moreover, the day is at hand when the instructor can no longer collect his laboratory materials by taking a stroll out-of-doors after regular working hours, both because of the encroachment of the machinery of civilization and because of the diminishing supply of laboratory plants and animals in much-frequented places. The present status of biological supply is this, therefore: the demand is about to grow by leaps and bounds, and the sources are as yet scarcely organized.

The present openings in established biological supply concerns are few, for the simple reason that such establishments are few and comparatively small. For very good reasons the full confidence of the prospective purchaser has not yet been won. The existant service of supply has been developed largely by business men with little appreciation for the real needs of biologists, or by biologists whose lack of business training has distinctly limited their scope of service to fellow-scientists. Too much in the past, and, indeed, even in the present, has the hope of big financial gains been the activating principle rather than that pride in the quality of product and service which logically comes first in the development of a sound and enduring business. The ill-scent of such attempts still hangs heavy in the nostrils of many who have tapped these sources of supply.

It is evident, however, that a new day is about to dawn. No longer will the instructor be satisfied with an inferior product, nor will he long be content to spend tedious hours of routine work on necessary laboratory preparations. There will be an increasing call for well-standardized products at moderate prices. Biological supplies have not yet been standardized, and the present business concerns which attempt to apply big-business methods to the present unstandardized products will not be the answer to the call. Sooner or later the young biologist who enters the service of supply in its present state of organization or disorganization will be called upon to choose between science and commercialism. If science wins, he steps out; if commercialism swings the balance, a scientist is lost and the problem remains unsolved.

There is, then, a great opportunity for young biologists with the proper training and aspirations to accomplish something unique in the interfaces of the spheres of science and business. It will, at first, be difficult and tedious work, with dividends small in comparison with investment. Old oppositions must be overcome, and new standards must be created. But to have a part in the establishment of dependable sources of plant and animal preparations for the biological laboratory will be to some young scientists a service eminently worth while, demanding at once the critical vision of a highly-trained technician and the clear, wide outlook of a master of modern business enterprise.

* * *

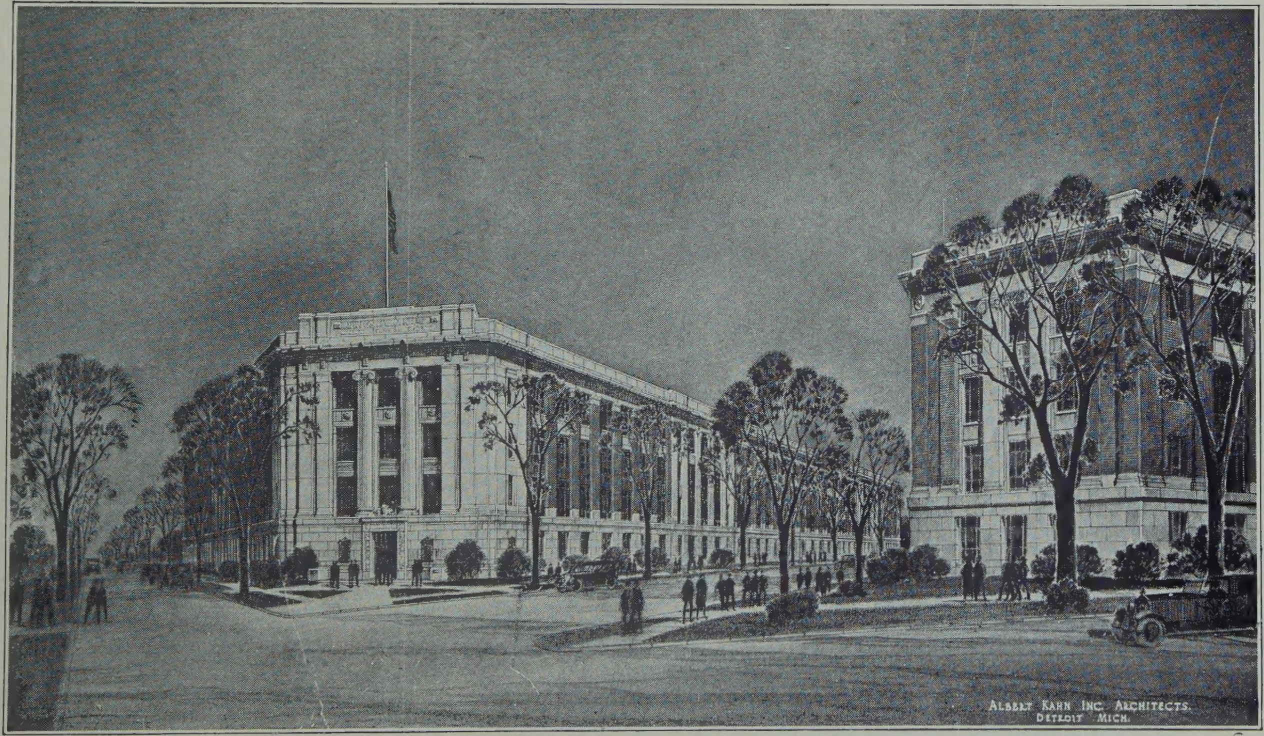
A wise old owl sat on an oak,

The more he heard, the less he spoke,

The less he spoke, the more he heard,

Why can't we all be like that bird?

* * *


ALBERT KAHN INC. ARCHITECTS.
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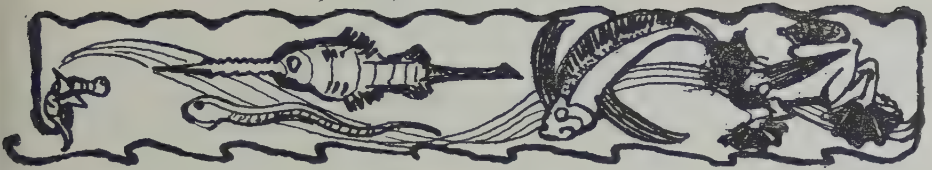
Museum of Zoology, Medical Center

NEW BIOLOGICAL BUILDINGS, U. OF MICHIGAN



Beta Chapter of Phi Sigma

By Carl P. Huber (Beta '24)

LET us imagine ourselve standing in the darkened corridor of the Natural Science Building on the campus at Ann Arbor. We are listening in on the surprising activity taking place in Room Z-242.

President A. F. Roe, "Will the meeting of Beta chapter of Phi Sigma Society come to order. Mr. Schultz, may we have the roll call."

Secretary L. P. Schultz:

"John Bielawski, C. E. Burnside, W. L. Crain, K. M. Davenport, W. T. Dempster, E. Doty, E. E. Ettinger, R. K. Enders, C. W. Greene, E. F. Greenman, J. H. Hauly, F. R. Harper, R. Hastings, J. R. Hickman, C. P. Huber, J. F. Huber, P. W. Kniskern, T. H. Langlois, F. H. Lashmet, R. U. Light, H. Moore, P. A. Moody, F. G. Novy, M. C. Old, R. C. Owens, M. H. Pike, M. M. Rhoades, C. R. Rittershofer, A. F. Roe, V. H. Ross, T. C. Schneirla, L. P. Schultz, L. C. Schultz, H. W. Shields, C. S. Sullivan, R. Sutton, B. D. Thuma, P. M. Winchell."

President Roe, "We will now hear the report of the Chapter Editor."

Chapter Editor reports as follows: (reads)

Ann Arbor, Michigan.
March, 1927.

Mr. Everett F. Davis,
Editor of The Biologist.

Dear Sir.

Enclosed you will find a much delayed report of the situation at Ann Arbor. You will find scattered throughout the following pages mention of the activities of many of the members of our chapter here. I think you will also notice how fortunate we are here at the University of Michigan in having such a wonderfully well equipped plant with every possible stimulus for the promotion of research among those of us who desire to do it.

I regret to say that I am not enclosing an interview with our most recent and most distinguished Honorary Member, President Clarence Cook Little but we can look to that as subject matter for a future communication. You know Dr. Little was an active member of Phi Sigma at the University of Maine before he came here to be President and we are indeed proud to have him associated with us now. Besides being President he is very active here in his own research work, problems in Genetics which are studied especially in the mouse. He maintains a laboratory in the new Medical Building where he may often be seen at work after presidential hours. We are hoping to have him with us at our Initiation Banquet which will take place sometime next month.

With the wish that the following report may be of interest to members of other chapters of Phi Sigma, I remain, Fraternally,

Carl P. Huber.

The Department of Zoology

The Department of Zoology is housed in the Natural science building, a four story brick and concrete structure built on the unit plan around an open court. This building also shelters the department of Botany, Geology, Paleontology, Forestry, Psychology, and Mineralogy. The Department of Zoology occupies all four floors of the northwest corner of the building—nearly a fourth of the total floorspace.

Several classrooms are devoted to lecture and quiz work. The remainder of the space is given up largely to laboratories and research rooms. There are seven class laboratories, each with a student capacity of eighteen to forty-five. Each laboratory is equipped with tables, stools, lamps, and microscopes. The laboratories have gas, alternating and direct electrical current, running water, and air under pressure. Most of them are furnished with hot water heaters. The physiology laboratory is well equipped with centrifuges, drying ovens, constant temperature chambers, and other apparatus for physiological work.

Research rooms and private offices occupy the entire fourth floor and part of the third. They are used by the faculty, research students, and assistants. Each of the faculty members has two rooms, an office and a research room, while the research students and laboratory assistants occupy single rooms. There is sometimes one student in a room, but more frequently two. These rooms are large (about 11 by 22 feet) and have high ceilings. Each is fitted with work tables and book cases, and there is a desk for each student. There are also complete connections for air, gas, water, and electricity.

Although nearly a thousand students take classwork in Zoology each semester, research is in no way sacrificed. Students are encouraged to enter some field of investigation both by the excellence of the equipment and the attitude of the faculty. There are available very complete and up to date research facilities. Four acquarium and vivarium rooms are used in experimenting on living forms. There is a subterranean cave below the lowest floor; here fossorial forms may be kept and studied. An animal reaction room equipped with various types of lighting apparatus for experimentation on animals forwards research in this branch of physiology. In the constant temperature room, experiments may be carried on at any desired temperature. Refrigerators, autoclaves, and incubators are also available. There are two photographic dark room units, one for ordinary developing and printing, the other with various sorts of photographic apparatus. Here are enlarging and reducing cameras, apparatus for making lantern slides, a large photomicrographic camera, lights, filters, and accessories for all types of photography. There is a collection of about 5000 lantern slides, a fairly complete set of wall charts, and several sets of wax demonstration models. There is a synoptic collection of vertebrate and invertebrate material readily available for teaching purposes. For general storage and maintenance of material, there is a stockroom. Any research student or faculty member may obtain for the asking whatever materials he needs in his work. Glassware, lenses, lanterns, stains, chemicals, projection apparatus, paraffin ovens, and special equipment and accessories are available. Research students are given whatever materials they require for their research. Even slides, cover glasses, paper, pens, and ink are supplied. Towels and laboratory coats are laundered without cost to the student. In the basement of the building there is a storage and preparation room where materials for classroom and research are prepared. It is here that the animals are preserved and injected and skeletons prepared. There is a shop, furnished with a lathe, punchpress, and ordinary carpenter tools, where equipment may be made.

Such are the physical advantages given students in Zoology. A less tangible but perhaps more important factor is the morale and investigational attitude of the faculty.

The staff of instruction includes seven men of professional rank. Professor Emeritus Jacob Reighard is well known for his researches on fish and on vertebrate ecology. Although he has recently discontinued classroom teaching, he directs students interested in his field. Professor A. F. Shull has investigated the genetics of rotifers and thrips, and he has prepared two widely used textbooks on General Zoology and Heredity. He conducts an advanced course in Genetics and also lectures on General Zoology, Heredity, and Evolution. Research students interested in genetics may work under his direction. Professor P. S. Welch conducts investigations in Limnology and on the oligochaete worms and insects, and gives courses in Entomology, Limnology, and Invertebrate zoology. Professor G. R. LaRue has been actively engaged in parasitology, especially on the group of trematode worms. He has a number of students working on various problems in this field. Professor P. O. Okkelberg's research interest lies mainly in that phase of embryological study involving germ cell origin, and he has students engaged in this type of research. Dr. Okkelberg teaches Embryology and Vertebrate Zoology. Professor L. V. Heilbrunn engages in research in General Physiology, his more important contributions dealing with the viscosity of protoplasm and the effect of anaesthetic agents upon protoplasm. Dr. Heilbrunn gives classes in physiology and students interested in physiology the benefit of his direction in their research. Professor Frank N. Blanchard has published extensively on the Amphibia and Reptilia. Students interested in herpetology have in him a thoroughly competent teacher. He instructs classes in Ornithology and Vertebrate and Invertebrate Ecology. In addition to these men, the staff includes several instructors.

The organization of the Department of Zoology is based on a staff system. The policies of the department are decided by a board composed of faculty members. Professor Shull is the chairman. Several committees are responsible to the board for such matters as efficient management of the stockroom, printing and distribution of reprints, advice to students, and the care of special equipment. Through this mechanism, the various features of the department are maintained on a plane of high efficiency.

Students are encouraged by scholarships, of which there are two that pay the tuition or fees for a research table at the Marine Biological Station at Woods Hole. Laboratory or teaching assistantships with a compensation of three hundred and six hundred dollars a year are available for ten or twelve people. Phi Sigma and two or three other societies do much in the way of helping students. A journal club which serves as a clearing house for the more general current literature is maintained. Each member once during a semester abstracts one or more articles from recent periodicals and discusses them with the other members. There are also two or three seminars or discussion groups, the members of which discuss the literature of the fields in which they are interested.

A number of students are engaged in investigation under the direction of some staff member. At the time of this writing, there are two students working in entomology, one on a reconnaisance of the beetle family Haliplidae, the other on the Simulid flies. Another student is working on the relations existing between the spongila fly and the fresh water sponge. Two students are attempting to decipher the life histories of trematode parasites, and two are working on the morphology of certain trematodes. One student is engaged in a comparative study of the chromosomes in several varieties of the house mouse. One of the families of cestode worms interests another student. One student is making a study of the embryology of the endolymphatic sac in salamanders. One man is engaged in research on the light and color perception of several forms of deer mouse. Several are engaged in a study of variation in fish, this work being done partly in the museum and partly under the direction of the academic staff.

The Museum of Zoology

The Museum of Zoology of the University is a research and teaching museum. A $900,000 building is now being erected and when finished will house the Museums devoted to Anthropology, Paleontology, Botany, and Zoology. About one fourth of the space is to be used for exhibits, the remainder of the building being devoted to storage rooms for collections, offices, work and preparation rooms, and laboratories. Each division will have extensive facilities for experimentation. It is expected that a vivarium will be constructed for maintaining large stocks of live animals.

There are six curators and also several assistant curators, each at the head of some department of museum activity,—one for Mammals, another Birds, Reptiles and Amphibians, Fishes, Mollusks and Insects. At present the Archeological and Anthropological collections are associated with the Museum of Zoology. There are thus two extra divisions.

Each division has extensive collections of specimens that are available for study to qualified students. The collections are especially rich in Michigan and North American forms, but there is an excellent series from all parts of the world. Stocks of pigeons, rabbits and mice, the latter wild stocks, are maintained and are available for study. The mice represent a large number of the species of the genus Peromyscus with many mutant strains. These animals offer splendid material for the study of genetics, morphology, physiology, and ecology.

As many as twenty persons have been engaged in field work for the museum in one year, expeditions having been recently conducted in China, Panama, South America and Africa as well as in some of the United States. In addition to its own field work the Museum co-operates with several states in biological survey work, with the Department of Conservation of Michigan, and with the Carnegie Institution of Washington. The Museum supports research tables at the Barro Colorado Biological Station in the Panama Canal Zone. Investigators may thus supplement work done in temperate climates by tropical studies. Three series of publications are issued: the *Occasional Papers, Miscellaneous Publications*, and the *Series of Handbooks.*

No formal course work is offered but advanced study and research may be undertaken in any division of the Museum. The broad training of the staff, the excellence of the collections and equipment, the spirit of research and co-operation combined with the personal attention received, make it an unexcelled institution in which to carry on advanced research work. During the current year ten men are studying for the doctorate.

Each year two fellowships, known as the Hinsdale Fellowships, are offered to students. The stipend is $600. In addition to these fellowships, University fellowships are sometimes available. Part time assistantships are also open in some of the divisions paying from $300 to $600 depending on the services rendered. These assistantships offer the best possible opportunity for learning the methods of a museum.

The Biological Station

The University of Michigan maintains during its summer session a station for instruction and research in biology. It is located on the shores of Douglas Lake in the uppermost part of the southern peninsula of

Michigan. This part of Michigan is diversified by hills and valleys and was formerly covered by forests of hard-woods and conifers, small tracts of which remain. The region contains many lakes of glacial origin. Douglas Lake is about four miles long and two miles across. The shores are wooded and the beach is of clean sand or stony. There are also sheltered coves and regions abounding in various types of aquatic vegetation. The location of the Biological station is in the transitional zone between the region of evergreen coniferous forest to the north and of deciduous hardwood forest to the south. Unusual opportunities are offered for the study of vegetation types of both regions and of the animals associated therewith. No other fresh water biological station in this country is so fortunately situated. The region is well adapted for the study of animals and of plants. The vertebrate fauna comprises about 37 species of mammals, 12 amphibians, 12 reptiles, 30 fish and a number of migrating birds have been recorded. The invertebrate fauna is much richer and there are many terrestrial and aquatic mollusks and many crustacea including plankton forms. Sponges and bryozoans are common, while fresh water hydra are usually present during the early part of the summer. The insect fauna is extensive in both aquatic and terrestrial forms. There are a number of aquatic annelids of considerable interest. In the numerous aquatic habitats the protozoa are found in great numbers. Parasitism in animals is extremely common. Parastic worms are abundant both in numbers of species and of individuals. Practically all of the vertebrates serve as hosts for the many types of parasites while certain invertebrates are hosts for larval stages. Pens, cages, and aquaria make possible the study of life histories by means of feeding experiments. All the habitats are typical and all are easily accessible from the station.

The buildings of the station include seven frame laboratories, a study hall, a stockroom, store, an aquarium shelter, dining hall and kitchen and 33 small houses. The laboratories are fitted with stoves and the necessary furniture and are used for recitations, laboratory work, offices and research. The equipment of the station includes one large and two small launches, two portable row boat motors, six rowboats, various types of nets and seines, traps, cameras, field glasses, compound and dissecting microscopes and accessories, microtomes, aquaria, and a large supply of minor articles. A good working library is provided. Independent investigators find all of the ordinary equipment of the laboratory at their disposal. Special equipment may also be procured. Members of the station are housed in one room cottages, each of which is equipped to house three or four persons. There are beds, table, lamps, and other necessary furniture. The ''Mess'' supplies meals of high quality at cost. The health conditions at the camp are all that can be desired. A trained nurse and camp doctor are available for any emergency.

Student Collectors

A Study in Aquatic Flora

Biological Station

Laboratory Building

There are courses given in Both Botany and Zoology. Work may be taken toward a bachelors or any advanced degree. Courses are offered in Entomolgy, Ornithology, Ichthyology, Herpetology and Mammology, Limnology and Helminthology. The Botany department offers courses in the taxonomy of green cryptogams, Bryophytes, and seed plants. There are courses in Plant Anatomy, Ecology, and Plant Geography. Research may be taken under the direction of any of the faculty members, many of whom are from other institutions than Michigan. The station is under the direction of Professor G. R. LaRue.

The Botany Department

The Department of Botany with a staff of thirteen men, not including assistants, occupies the Southeast corner of the Natural Science Building. This structure contains an inner courtyard with a perennial garden, a modest fernery, a fish-pond and a fifteen-foot width greenhouse. Except for field work and large-scale greenhouse operations, the Botany Department is a complete unit for handling all phases of pure botanical research and instruction. In the department there are twenty-two private rooms equipped for investigators, and eight laboratories for the teaching of elementary and advanced courses in Botany.

The course in elementary botany, as would be expected, has the largest enrollment of any given in the department. The enrollment is well over 200 each semester, requiring a large staff of instructors and assistants to handle the sections. There are three special laboratories for this work.

The laboratories for advanced work are as follows: Cytology and morphology, Mycology, Biochemistry, Physiology, Plant Anatomy, Microbiology and Forest Botany. The genetical laboratory work is done at the Botanical Gardens which will be described later. All laboratories are equipped with modern apparatus, and special equipment can always be obtained to meet the worker's needs.

Besides the laboratories there are cold-rooms, ovens, photographic-rooms, etc., to meet all requirements.

At the present time there are about twenty-five graduate students working in the department, about one-third of which are studying for their doctorate degree.

The Herbarium

The Herbarium, now housed in the Botany Department, but soon to be moved into spacious quarters in the new Museum Building, has approximately 120,000 collections of plants about equally divided between Cryptogams and Phanerogams. It is the aim of the Herbarium staff to accumulate the species of North American plants, primarily. The Herbarium is exceedingly well stocked in sedges and grasses, Rosa, Compositae, in the Phanerogams; and in the Cryptogams, Hymenomycetes and Rusts. The staff consists of nine people two of which are honorary only. Four members of the staff spend full time in the identification and preparation of specimens. In the last six years the Herbarium has doubled in size.

The Botanical Gardens

The Botanical Gardens, intimately connected with, but not a part of the Botany Department, consists of forty acres of land about one mile from the campus. Its purpose is to provide a museum of living collections of plants that may be observed through all stages of development. All collections are accessioned and are of known origin. There are, at present, about 5,000 collections of plants permanently established. At present about ten acres are devoted to experimental plant breeding and physiology. There are five large greenhouses with collections of exotic plants and five small houses for individual investigators, besides laboratory space. Work going on at the present time includes, genetical work on Oenothera, Zea mays, Capsicum, Solanum, Rosa, and Hibiscus; systematic work on Rosa, Rhus and Prunus; growth-rate studies on tomatoes, corn, and beans. There are ten in all on the research staff of the Botanical Gardens.

Forestry at Michigan

That research in forestry is just as necessary as in other branches of science was early recognized by Professor Filibert Roth, founder of the University of Michigan Forestry Department. In tribute to Professor Roth's service to this science, Professor H. H. Chapman of Yale described him as "forester, leader in the aristocracy of service, a builder for the future, and lover of men."

To facilitate the study of forestry, Professor Roth established fully equipped laboratories and timber properties at the University of Michigan and in the vicinity of Ann Arbor. Special facilities for this study are supplied by the Saginaw Forest, a tract of 80 acres of land two miles west of the city. Over fifty distinct plantations here serve to illustrate the results of the various European and American methods employed in the study of forestry. These plantations offer special opportunity to carry on experiments in the care of forest stands, involving management and regulation studies, silvics, silviculture and practically all phases of forest work. Special studies and advanced work in correlating field data for forest protection and the various phases of forest administration are given at the University.

A privately owned area of fifteen hundred acres, including several watersheds has been placed under the management of the department. In the management of these tracts the student has every opportunity to become familiar with protective watershed and reforestation work. Through the courtesy of the Conservation Commission of the State and the U. S. Forest Service the classes are enabled to study the work of improvements, protection, and reforestation on a large scale on state forests and the Michigan National Forest.

The Eber White woods is a tract of native hard woods located within easy walking distance for the students of the University. This tract of timber is handled by the Department as a selection forest on a ten year period of return.

The Stinchfield Woods, consisting of three hundred and twenty acres of land is a recent gift to the Department of Forestry. The possession of this tract greatly enlarges the opportunities for the study of forestry at the University. Here students carry on all the operations involved in the development and handling of a forest property on a scientific basis.

A forest nursery of over two acres has been developed to supply planting stock for the school's forests, as well as to offer opportunities for the student to develop the best methods for seeding and planting.

Laboratories equipped with the necessary testing machines and apparatus for the study of timber physics, and laboratories with facilities for work in dendrology, silvics, and silviculture are available to the student. The location of the Forestry Department in the Natural Science Building at the University also affords unusual opportunities for study and consultation in the closely allied subjects which are necessary to the professional forester and specialist.

The Department of Psychology

This department in the University of Michigan is exceptionally well equipped from the standpoint of that portion of psychology which is of particular interest to biologists, that is, comparative psychology, or more specifically, animal behavior. We are singularly fortunate here in the fact that Dr. John F. Shepard, Professor of Experimental and Comparative Psychology, had under his supervision the construction of the Natural Science Building. Being an experienced experimentalist in the sphere of comparative psychology, Dr. Shepard was well able to anticipate the needs of research workers in this field, and for the construction of the building laid his plans accordingly.

As a consequence, the department is equipped with better facilities for studying maze learning in animals than is perhaps to be found anywhere. The maze room is a darkroom, approximately 25 feet square, located in a subcellar of the building. It contains at present a large maze, 15 feet square, capable of being adjusted to numerous maze patterns, and of a size to accommodate any of the smaller animals such as the cat, rat, or monkey. The performances of the animals are observed from the floor above by means of a hole in the ceiling, which arrangement eliminates the possible disturbing effect of the close proximity of the experimenter. Ample quarters for the animals are provided in rooms adjoining the maze room.

The department is also provided with numerous darkrooms for work in vision, and in addition, a good soundproof room for experimental work in sound discrimination. The latter room is located on the fourth floor of the building and is surrounded by a three inch air space and 8 inches of sand. The air space and the room itself are completely lined with heavy one inch felt.

The courses given in the department of especial interest to students of Biology, besides those in general psychology, are two courses in comparative psychology (animal behavior) and a course in color vision by Dr. Shepard; a course in biometric methods by Mr. Carl R. Brown; and a course in the structure and function of the central nervous system in relation to behavior given by Dr. Adelbert Ford, members of Phi Sigma. The department is also very fortunate in having the excellent cooperation of Drs. G. C. Huber and Elizabeth Crosby of the Department of Anatomy and Neurology. Dr. Crosby is giving a course in comparative neurology and Dr. Huber is conducting a seminar in that field.

The members of Beta Chapter who are at present working for higher degrees in the department are Mr. Carl R. Brown who, besides instructing, is engaged in a problem in color vision; Mr. Theodore C. Schneirla who is studying maze learning in ants; and Mr. B. D. Thuma who is working on pitch discrimination in white rats. Mr. Norman Cameron, at present an instructor in the University of Wisconsin, is taking his degree in absentia on a problem of the functions of the cerebrum in the learning processes of white rats.

University of Michigan Dental College

The Michigan Dental College has always stressed the importance of research. Any student who so desires has access to the laboratories of the various departments; also all possible encouragement and assistance is given to the ''new man'', so that his initial obstacles shall not set him down too hard. From the first year and on, the heads of the departments engaged in research present their work to the classes by way of the screen or actual demonstration. In this way the classes become interested in what their professors are accomplishing, and either consciously or unconsciously they do some thinking along these newer lines.

Considering the departments separately:—In the Pathology Laboratory Dr. Bunting and associates are now working on Bacillus Acidophilus. They are considering three possibilities; namely 1. The presence of a Lytic principle in the normal saliva. 2. The effect of diet on Dental Caries, 3. The reaction to various dye treatments. In this experiment human beings, rabbits and rats are used, so consequently animal behavior in relation to human changes under various conditions is an interesting topic for the department. Parallel conditions in the various groups show us many times that different species react in much the same way to the organism we are studying.

In the Therapeutic Department Dr. Rickert and his associates are now studying the power of penetration of various antiseptics through human enamel and dentin. Much fine work is being done in this new field. It is a problem that has long waited a definite answer.

In the Orthodontic Department it is the rule to consider every case from a biologic standpoint. Malformations have always been one of the queer acts of nature, so that evidently each case is a problem different from the rest. I have yet to see a field more fertile in the possibility of research than orthodontics possess.

Bacteriology

The arrival of the present school year found the Bacteriology department occupying its new quarter in the recently completed medical building.

The growth of this department, from its birth as one of the first bacteriology departments in America boasting of "one complete set of Koch's apparatus," to its present state of equipment would be a worthy story in itself. However we must limit the task at hand to a description of the present facilities of the department for research.

The equipment of the Bacteriology Department, as other departments, consists not only of apparatus and rooms, but of men capable of directing research. It may not be out of order to say a word concerning the staff of the department. Dr. F. G. Novy, as head of the department, stands always ready to aid the young worker in his efforts to learn the ways of scientific research. The word "control" might well be called the pass word of work that comes to the attention of Dr. Novy. The student investigator early learns from the experienced teacher and investigator, the absolute need of adequate control of every possible factor in his investigation. Dr. Novy is an honorary member of Beta chapter. Besides Dr. Novy there is Dr. Philip B. Hadley who likewise stands ready to aid the young worker from his store of scientific research experience. Dr. Herbert Emerson, who has charge of the diagnosis and treatment of rabies as well as teaching advanced bacteriology and water analysis, is at present spending a year studying in European laboratories. Dr. Malcolm Soule, who has been closely associated with Dr. Novy in their exact respiratory studies on microorganisms is likewise one whose help is often sought in pointing out possible landmarks in the exploration of the unknown. In addition to these men who are members of Beta chapter, Mr. A. F. Roe and W. J. Nungester, graduate students, are also members of Phi Sigma. Mr. Roe, who has been very active in Beta chapter for some time, was elected president of the local chapter for this year as well as chapter delegate to the national convention.

The physical equipment of the department is distributed over three floors of the north wing of the building. In addition, half of the fifth floor of the north wing is also devoted to the purposes of Bacteriology. Ready communication between floors is made possible by means of an electric elevator.

A hasty survey of the department will serve to orientate the reader as to the general outlay of the department.

On the first floor is located the Pasteur Institute for the diagnosis and treatment of rabies, water analysis laboratory, library, photographic rooms, store rooms and a special centrifuge room. Offices, large teaching laboratories, cold rooms, constant temperature incubation rooms, dispensing room and four experimental rooms particularly designed for those doing research work are found on the second floor. The third floor is the counterpart of the second floor.

All animal work is done on the fifth floor. Here the stock animals are kept in rooms supplemented with outdoor runways on the roof. Across the hall from the stock rooms are small animal operating rooms where all inoculations, bleeding, etc. are done. Also all animals under experimentation are kept on this side of the hall.

The department is able to furnish excellent advantages to the man desiring to know a little more than is already known concerning the science of bacteriology.

The Evolution Question

This March number of The Quarterly Review of Biology introduces Reginald Cock, practising physician of London, as a fundamentalist who has taken a vigorous stand against the modern biologist's concepts of Evolution in his recent book, "Genesis vs. Evolution."

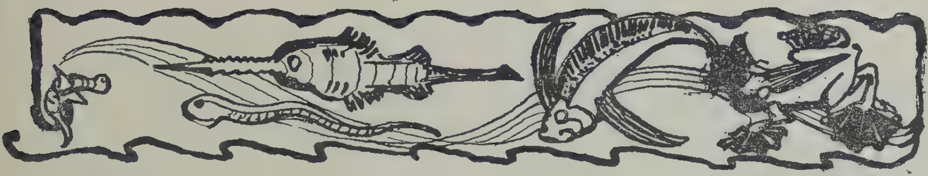
To quote the Quarterly Review, "We take pleasure in presenting him as the second entrant into our Fundamentalists' Portrait Gallery (photograph included with the book review) reminding our readers that Rudolf Valentino has unfortunately passed away."

The book is dedicated to William J. Bryan, Esq., but the Quarterly Review hastens to add "It must not be inferred from this that Mr. Cock and Mr. Bryan are birds of entirely the same intellectual feathering. They are not quite, although both have equal faith in the infallibility of Holy Writ. Mr. Cock knows more about biology than the silver-tongued statesman ever knew about anything." Readers of THE BIOLOGIST who will read for themselves, will find the editor's sentences in the Quarterly Review stippled with entertaining bits of sarcasm.

Nor can the editor of THE BIOLOGIST read through the last few remaining pages of this issue of The Quarterly Review of Biology without calling attention to the prank which Doctor Raymond Pearl's office boy, Reginald, has played by piecing together two articles which appear side by side on pages 147-148, under the caption "Debate about Evolution pro and con."

"The Tripotage"

Well, "The Tripotage" has come around once more in the editorial columns. In deference to our interests it should be stated that no one has sent any suggestions pertaining to the questions as originally stated in vol. 7, No. 1, p. 7, 1925 of THE BIOLOGIST, "How can we Interest our Alumni?" What shall be the answer—are you going to let this opportunity slide?



Botanical Field Work in Montana[*]

By J. E. Kirkwood

A NEW country interests the naturalist because it is constantly presenting the unknown to his eager observation. He feels the fascination of adventure and exploration, of the chance of discovery and achievement. It captures his imagination and every vale and hillside are like the pages of a thrilling story. Such is our region and opportunity and although over 120 years have passed since the first observations were made upon its flora, there still remain considerable areas within our own state as virgin as in days of Lewis and Clark. Even those areas best known to collectors are still fertile in possibilities. To all who know the vast spaces and magnificent distances of our mountain solitudes nothing need be said to show how little has been done compared with what remains untouched. Around the towns and along the highways and the better known trails most of the present knowledge of the flora has been gathered. Let us cast back for a moment briefly over the range of past discovery, over the introduction so to speak, and then forward into the great work that lies before us.

A couple of years ago the speaker was permitted to turn the sheets of an old collection, most sedulously guarded in the Philadelphia Academy of Sciences. Priceless, though mostly mere fragments and poorly prepared, this first collection of our Rocky Mountain plants was brought to the notice of the world by that memorable expedition of 1905 and 6. From the time of Lewis and Clark it was 20 years before another botanical observation was made in this region, when David Douglas approached the Rockies from the west in 1826. Maximilian, Prince of Neuweid, made notes on the vegetation at the mouth of the Yellowstone and up the Missouri as far as the Marias River. Then we read of Nathaniel Wyeth whose journeys to Oregon began in 1832 and lasted three years. His route lay via the Green River and the Snake. Nuttall, whose name is familiar to every student of botany, accompanied Wyeth in 1834. There appears, however, to be no record of his collections made on this trip. One of the trips of Wyeth seems to have been by way of the Clark's Fork and the Bitter Root to the Salmon River of Idaho, and thence to the Bighorn and the Yellowstone. Charles A. Geyer, another whose name is commemorated in the language of the science, in 1844 travelled from Clark's

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[*] Address of installation of Chi Chapter of Phi Sigma at The State College of Montana, Bozeman, Feb. 11, 1927.

Fork to the Yellowstone, via the Bitter Root and made collections which later were distributed to several European and American institutions. David Lyall, with the Oregon Boundary Commission, collected along the Canadian line in 1861 as far east perhaps as the Continental Divide. Next, John M. Coulter, known among botanists the world around and now associated with the Boyce-Thompson Institute at Yonkers, N. Y., came with the Hayden Survey in 1872 and collected through the valleys of the Yellowstone, Gallatin, Madison and Jefferson rivers. His work on this flora still forms the basis of one of the important manuals of our flora. Sereno Watson in 1880 collected along the trail through the Bighole, the Bitter Root and Lolo Pass. R. S. Williams, well known in this locality, as an express rider and pioneer, collected in central Montana from 1880-1899. His original collections you have with you here. Williams is now connected with the New York Botanical Garden and to those fortunate enough to know him tells interestingly of early days along the Musselshell and the Missouri. And we might speak of Tweedy, Parry, Leiberg, Kelsey, Koch of your own city, Jones and many others whose names are secure in the history of Rocky Mountain botany.

It will not do, however, to close this brief summary without reference to two whose work on the flora of Montana stands out with distinction. J. W. Blankinship, professor of Botany at this institution from 1898-1906, collected widely throughout the state and published various papers on its flora. He was an active and able worker and I recall with interest his many labels in our own herbarium bearing legends of the Gallatin Valley and other places in this vicinity. It was my pleasure to meet him a few years ago in his home in Berkeley, California, where he was then employed in connection with smelter interests in relation to vegetation.

P. A. Rydberg, for years an active student of our flora, is now Curator of the Herbarium of the New York Botanical Garden. He began his work on the plants of this region in 1895 and published in 1900 his "Flora of Montana and the Yellowstone National Park". Ten years ago appeared his "Flora of the Rocky Mountains and Adjacent Plains" now in its second edition, a valuable work and the most complete manual of the flowering plants now published for the Rocky Mountains. Numerous monographs and contributions have appeared from his pen through the past 30 years, and with the prospect of many vigorous years yet to come we may expect his contributions to the knowledge of Rocky Mountain botany to be extended still further.

The early history of botany in Montana was made along the main routes of overland travel, merely trailside collections, often hurried and meager. Even many of the later collections were made along rivers, railroads and highways and comparatively few have made extended trips into remote and difficult places. Most of our high mountain area is as yet untouched. On competent authority it may be stated that the area between the Great Northern Railroad and the Canadian boundary from Shelby east through Montana is still unknown. The whole Blackfoot Valley seems not to have yielded a single authentic collection since Lewis traversed it in 1806, except those made by the State University in recent years. The University also in 1925 was the first to make botanical collections and records in the valley of the South Fork of the Flathead and most of this area of 1500 square miles still remains to be explored. Leiberg touched the Idaho Clearwater along our western border in 1898 and brought out a small collection, which with its notes is accessible in the National Herbarium. This the University supplemented with collections in 1923-24, but only one who has tried to travel that wilderness of 3500 square miles knows how little of it can be represented in the observations of two seasons and how much more remains a sealed book. The whole Cabinet Range is still as virgin botanically as on the day of its creation and many others equally so, so far as published records appear. The high Bitter Roots, except for some recent work, the upper Swan River, the eastern side of the Mission Range and many other areas are still untrodden ground.

While the systematic botany of these areas still remains unknown there are other problems of great interest connected with the floristics of our region. The present plant population can be picked up as the money, time and talent are available, but the history of our flora, its sources and movements are matters of deeper insight. Post-glacial migrations have populated our northern mountains with plants from the east and west and south. Our flora is a complex of species from the Appalachian Center, the Pacific coast and the Mexican Plateau. Here at the top of the continent the eastern and western floras overlap. The farther east we go the more do we find for instance of those plants described in the Illustrated Flora, the farther west the more numerous become those indigenous to the Pacific coast. Southward the species of cacti multiply, and the yuccas and salt bushes and greasewoods and the various composite shrubs. Northward the plants of our early vernal and subalpine flora increase in numbers. The endemics of the region are not so numerous as one might expect and in former days we used to find that Nelson's Manual, Britton and Brown's Illustrated Flora of the Northern States and Canada, and Howell's Flora of the Northwest identified most of our species.

The problems connected with the movements of these intermingling floras are those of time involved, of sources and pathways, of post-glacial climate and prevailing winds, of topography and barriers and dispersal mechanisms. There is no reason to believe that the present condition is fixed, or that the migrations of native species are not still going on, or that all species within their present limits have reached the bounds determined by their moisture and temperature requirements. Civilization is, however, a disturbing factor and it may not be certain that what is observed in the future will be due wholly to natural causes.

Some significant facts may be pointed out as having a bearing upon the problems of distribution. Why are there no oaks, hickories, chestnuts or other heavy seeded species, except the hazel, in the northern Rockies? Why are the arborescent and shrubby forms mainly those with dispersal mechanisms suited to movements by wind or birds? Why have the species with best facilities for dispersal by the wind travelled farthest and why are their ranges extended in the direction of the air movements. Of the 63 species of woody plants apparently reaching Montana from the west, 27 have seeds winged or especially fitted for riding the wind, 21 have succulent fruits sought by birds, and the rest have small or minute seeds. Similar facts are true of those which seem to have entered our region from the east and south.

Time will not permit of going into all the geological evidence of the history of our flora as it is. Let it suffice to point out the general trend of our northern ranges along which vegetation finds its appropriate levels and a natural highway for its movements. These ranges extend far northwest into Alaska. In the north they approach the Cascades and in British Columbia and northern Washington cross ranges connect the two systems. Farther south the aridity of the great basin formed an effective barrier reinforcing the effect of the high crest of the Sierras and Cascades. The course of migrations from the west coast must have been northward west of the Cascades, eastward along the cross ranges and southward along the west slope of the Rockies. Wherever moisture conditions are favorable along the western slope of the Rocky Mountains we find a liberal population of species well known on the west coast and the number of these increases as we go northward. The dominance of Pacific coast species in the northern Rockies over the eastern element may be due to the shorter distance they have had to travel in the same length of time.

Seeking thus the geographical affinities of our flora we are led far beyond the mere description of species. The establishment of genetic affinities is the aim of systematic botany but how much more clear and satisfactory such treatment of species becomes when produced in the light of their derivation. The future of our botany must take account of this factor. The speaker ventures this prediction with the full consciousness that he is not a taxonomist. He is convinced, however, that systematic botany would be both more interesting and more scientific in many of its present productions if it got away from some of its present mechanical limitations.

The attention of competent students must also be directed toward the settlement of some of the questions relating to disputed species of this region. The lack of knowledge of the flora above referred to and the construction of our manuals by authors working 2000 miles from where the plants grow can hardly be expected to produce results wholly satisfactory or permanent, however helpful they may be as steps in our progress. Whether there are 4 or 14 species of birch in the Rocky Mountains will have to be determined by field, or better yet, by experimental studies. When the author of a recent manual defends the larger number by referring to the herbarium specimens he should be aware that in several genera, including *Betula,* widely divergent shoots may be gathered from the same tree. On the other hand, owing to the same lack of adequate knowledge, many of our mountain species may be erroneously included under more familiar eastern or western forms and only local study will reveal the truth.

Emphasizing thus the work on the ground as being the course most likely to lead to accurate results, I wish before leaving the subject to point out another line of research that is now being developed, which we may call experimental taxonomy. When we bring together two or more varieties of a species, or supposedly different species of the same genus, and cultivate them under uniform conditions, claims for distinction or identity may be established or refuted. This procedure is not new, but strangely has been employed by ecologists more than by taxonomists.

With this brief glimpse at the problems of a systematic nature that await attention in Montana, let us turn for a few moments to some of the ecological questions. The structure and direction of our northern ranges, their diversity in altitude and exposure, the attendant differences in temperature and moisture, all go to make the region one of the most interesting and significant for the study of plant life in relation to environment. The limited rainfall and semi-arid conditions lead to a strong topographic control of the vegetation, expressed often in grassy southern and timbered northern slopes. The position of mountain ranges athwart the direction of moisture-bearing winds introduces another factor in the control of vegetation, viz., local climatic variations and the operation of barriers to the movements of species. Soil conditions differ widely within small areas. The range of altitude is over 11,000 feet. Moreover, the marginal interminglings of eastern and western floras in relation to local factors may afford interesting fields of study.

The mass elevation of a belt 500 miles in width along the Continental Divide is itself an important influence affecting the eastward and westward movements of species, augmented as it is by the cumulative effect of successive ridges of higher elevation. The vegetation of the individual ranges reflects the conditions to which they are subject and often presents unusual opportunities for investigation. The Bitter Root mountains may serve as an example. They extend for 70 miles southward from Lolo Pass to the head of the West Fork of the Bitter

Root river. They rise to heights of 9,000 to 10,000 feet with the lowest pass at 5400. They intercept the rain-bearing winds from the west so that their western slopes have about three times the rainfall of the Bitter Root valley, lying to the east. The consequence is seen not only in the density of the forests of the two slopes but in their constituent species and the elevations at which they occur. The life zones are tilted toward the west with differences of 500 to 1,000 feet in the altitudinal limits of distribution of their characteristic trees. The trees are larger on the western slope, the verdure of early summer continues late into August, the meadows of the Clearwater grow lush with tall herbs and rank grasses and northern slopes bear impenetrable jungles of undergrowth. Here are plants of the Pacific coast humid belt growing as if at home in the forests of western Oregon or Washington. Such an area as represented by the two slopes of this range offers a fascinating problem.

The vertical distribution of species is a matter of much interest. Take any trail up a western Montana mountain and you pass from the grassy foothills into yellow pine which gives place to lodgepole and this in turn to white bark pine, spruce and fir, and then, if at 8000 feet or more, into thin stands of Lyall's larch and higher yet onto the cold and bleak rocks of the treeless peaks. Underfoot we pass over no less significant transitions and we can nearly guess our elevation by the plants along the trail, when we note the bear grass, the grouseberry, the mountain heaths or arctic willows. What are the controlling factors of this distribution? Is it moisture or temperature? Is it atmospheric or soil moisture, or both? It is to be hoped that some day facilities may be provided for experiment and observation concerning these questions.

In no part of the country is there better opportunity for the study of associations. With all the varied conditions and wide range of species the number of assemblages of local or general significance are many. Some are so typical that from the cosy vantage of a winter fireside we can picture their general physiognomy and component members. We know just what we would find under a given set of conditions. We almost know what we would find at a given geographical point. Still the problems of these associations are far from being solved. We need more intensive study of these areas both in their genesis and progress than ever yet has been undertaken. The mountain meadow, the timber-line forest, the lodgepole stand, the yellow pine zone and the prairie and the tension line between them, these and many other associations are full of interest and promise.

The study of our plant associations, although intricate and extended, need not be forbidding to anyone with a desire to look into their mysteries. Their analysis will be the cumulative result of many contributory studies, in which you and I should share. While the use of instruments in the study of light, moisture, temperature and the like are indispensable, we must realize that too much of the present ecology is an approach from the side of the physical factors to the neglect of the equally important biotic ones. The range of the requirement of the plants themselves which make up the principal parts of an association is quite as important as to know the rainfall of the area, the temperature and the soil structure. As the distribution and prevalence of a species is the resultant of its positive and negative qualities, so any plant community is a complex of the requirements of its constituent species. Every one of these species must be the subject of an individual investigation before we can write the final chapter on the ecology of their community.

Just what does this intensive study mean? Let us take, for example, any one of the conspicuous members of our western plains associations. What do we know about it beyond the surface characters by which it is identified? How many seeds does such a plant bear? What proportion of such seeds are viable? How long do they retain their viability? How many of them would get a start in the soil under natural conditions? How long does it take to grow the plant from seed to maturity? What are the conditions attending successful pollination? These are but a few of the lines of inquiry pertinent to the problem of each species. The study of the seeding habits is not difficult and requires little equipment to carry on, merely time and interest, yet such a story would be a worthy effort on the part of any investigator.

What about the persistence of seeds in the soil, particularly in forest soils? Startling assertions are made as to the endurance of viable seeds in the litter of the forest floor and growth therefrom subsequent to fires. The subject needs further investigation and it should not be a difficult thing to determine by experimental means.

One of the enticing fields of ecological study and one well represented in our region is that of succession in which one type of vegetation supplants another upon the same area. One association of plants prepares the way for the next and that for the one following and so on until the climax is reached. The climax type is necessarily composed of shade-enduring species and maintains itself indefinitely. Some of these transitions are of special interest and proceed to the same end by different routes and in varying periods of time. On contiguous areas one may see at once all the phases of succession from bare rock surface of a talus slope to a dense forest. First appears the lichen encrusting the surface of a freshly broken stone, then the lichens of more leafy or bushy forms, then the mosses crowding out the lichens and filling the chinks between the stones. Herbs follow and waste of their bodies makes soil for the larger plants, shrubs and trees and eventually the climax forest. Or if on a sunny slope it may pass into the grass-land stage to continue perhaps indefinitely, though the fate of the prairie in many places is to be succeeded by the forest, first the yellow pine, then the Douglas spruce or other species. The time required for such changes is an important consideration and doubtless differs with locality and climate but there appears to be no record of an attempt at quantitative studies in this direction.

The successions of a peat bog flora are familiar to all students of ecology. Such bogs are not common in our state but some other types of aquatic successions are. If you could go with me along many of our mountain streams, especially those shallow and comparatively slow streams like the West Fork of Sun River, we might see in all its phases the beaver-meadow succession. First, we should find the beaver busily felling trees and throwing a dam across the stream, then the pond backed up over several acres of ground involving the destruction of the vegetation thereon. After a lapse of years come the aquatic sedges, grasses and other plants, growing first about the edges of the pond, then encroaching upon its center, gradually forming a mat of roots and debris on which other plants find footing, themselves followed by willows and other shrubs and finally by a forest, probably of spruce. The beaver moves out or seeks to reclaim his pond by raising the dam or building another in a more promising place. A good problem for research this, and as yet apparently untouched.

One more phase of the succession comes nearer home. We all know the fate of many of the dry farming efforts in eastern Montana. Fields once hopefully sown to wheat were abandoned to tumbleweeds which occupied seemingly every inch of the soil. In a few years the weeds for some reason became fewer and native prairie plants began to come in. How long will it require for the original vegetation to resume its sway over these areas? Here again is an interesting and not difficult problem for some one to whom such fields are accessible.

These brief remarks on the past and future of certain aspects of botany in Montana have about run their allotted time on this occasion. That more might be said on all phases of the subject is, of course, very obvious. It is hoped that the few words here spoken have suggested the abundance of the opportunities that lie about us. If they have helped to polarize research impulses in the direction of definite problems they will have served their purpose well. And what has been said for botany may doubtless be repeated with variations but with the same emphasis for the zoology of this region.

With opportunity come obligation and responsibility, no less in our field than in others. While we should welcome the efforts of all who contribute to the knowledge of our flora and fauna their coming into our region to solve the problems at our doors should bring to us some feeling of chagrin, some attitude of apology for not having done some of these things ourselves. We cannot rightly take refuge in the excuse of other duties unless we make a sincere effort to utilize whatever time we have.

Appreciation of research is the vitalizing ideal of Phi Sigma. The soci-

(Continued on page 28)

IN MEMORIAM

NATHAN L. GRIFFIN

July 12, 1875—Dec. 23, 1926

Whereas, On December twenty second, nineteen hundred and twenty six, God in His Almighty Providence saw fit to remove from our midst a most worthy and esteemed brother, Doctor Nathan L. Griffin, Honorary Member of Phi Chapter of Phi Sigma; and

Whereas, In full realization of his life of service as physician, citizen, and benefactor of mankind, and in further realization of the unselfish and untiring efforts he put forth in aiding thousands of ill and injured in regaining their health and happiness; and

Whereas, Realizing that not only has the world lost a devoted servant of humanity, but that we also have lost a loyal and devoted brother; therefore be it

RESOLVED, That the Phi Chapter of Phi Sigma mourns the loss of our esteemed brother, and bows in reverence before an all-wise Providence; further let it be

RESOLVED, That we hold ever before us the example of his noble and generous life.

Meditations of Biology Student

Dr. Cunningham is my Biology Professor; for knowledge of the mysteries of monkey ancestry, Embryology, and every thing connected therewith, I should not want; but I do.

He maketh me to read various and sundry dissertations upon the subject.

He leadeth me beside those abominable theories, which I do not understand, and one from the other of which there seemeth to be no discrimination.

He agitateth my soul, he leadeth me in the paths of Science for his name's sake.

Yea, tho I study biology for years to come, I shall never arrive at a definite conclusion along any line, for thou tellest me one thing one day and the opposite of it the next. And thus everything in my mind is without form and void.

Surely because thy goodness and mercy have followed me, I shall continue to study biology forever and ever, even tho thou flunkest me.

—*Nola Jane Gentry*, *Tau*

SIGMA BETA RHO bows before mystic shrines and offers her hand to Greek Letter Societies. This blushing blooming blonde is our season's "deb", and dame rumor has it that she is already engaged. To wit, we quote as follows: from stationery which bears the Greek letters ΣΒΡ: "May we count on the support of your school and department in establishing a strong national honorary biological fraternity?"

The envelope bears the postmark Peru, Nebraska, and the letter signs itself *"Head of Biology Department"*.

All success to our sister society.

Quantum sufficit

The editor wishes to announce that the editorial policy of this magazine proposes that no member of the staff assume liability for the inauthenticity of certain citations to literature published by members when the titles or references to these papers in print do not coincide minutely with the spelling, punctuation, arrangement, etc., in their original hand writing.

If you are unable to recognize your hastily dictated or pen scratched titles see the chapter editor or think it over yourself.

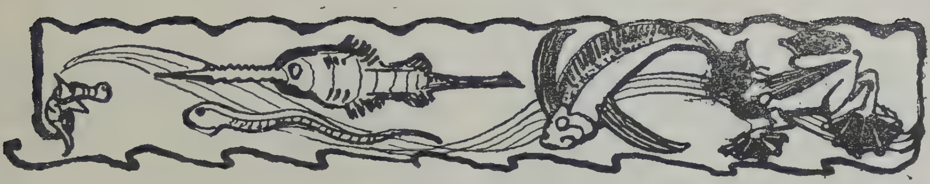
Botanical Field Work in Montana

(Continued from page 26)

ety hopes to stimulate, to encourage and to assist us in all efforts toward the extension of knowledge. In these Montana chapters, yours and ours, let us keep ever in mind the ideal and work toward it. If Montana has boundless opportunity, she likewise has no lack of those innately capable of utilizing them. Let us address ourselves to the work and make good.

J. E. Kirkwood

Professor of Botany
State University of Montana



Anti-Evolutionism

(A Critical Review of Some Recent Books)

By Clifford H. Farr

The Dayton trial was the signal for the assemblage of the forces of the fundamentalists in America against the theory of evolution. Prior to that time their attacks were confined largely to the pulpit, and to influencing the legislators of certain states to pass laws restricting the instruction in the schools. This was partly a matter of retaliation against the exclusion of the Bible. The states particularly chosen were those in the southeastern region, because of the ignorance of a considerable proportion of the voters (the poor whites), and because of the inference that the theory of evolution means racial relationship. In addition Minnesota and the Dakotas were thought likely ground because of the confidence of a considerable percentage of the Scandanavian population in the Lutheran clergy, and California because of its tendency to fadism. So far these efforts have been crowned with recent legislative success in Tennessee, Oklahoma and Mississippi. But it would be folly for the supporters of science and of the freedom of education to conclude that the conclusion of the trial or the passing of Mr. Bryan has put an end to the conflict. In fact the situation seems quite the reverse. Just now North Carolina and Georgia are being made centers of concentration; Kentucky, Florida and Texas came dangerously near falling prey; and the campaign is passing from the pulpit into our general journals and our libraries and book stalls, where it is destined to have a more lasting effect.

During the trial and following it a number of small books have appeared attempting to set forth the views of the biologists toward religion and the future of society and also the evidence which the biologist has found as to the validity of the theory of evolution. Among these are "Science and Theology" by F. W. Westaway, "Science and Theology" by C. Stuart Gager, "The Religion of a Darwinist" by Sir Arthur Keith, "Science as Revelation" by John M. Watson, "The Gist of Evolution" by H. H. Newman, "What Evolution Is" by George Howard Parker, and "The Earth Speaks to Bryan" by Henry Fairfield Osborn, "Evolution and Religion" by J. T. Sunderland. On the other hand a number of books have appeared purporting to show the absence of foundation for the theory of evolution, and to expose it to ridicule.

Among these are "Science vs. Evolution" by Sterling Price King, "The Sins of Science" by S. Klyce, and "The Dogma of Evolution" by Louis T. More. It is impossible to state whether the evolutionists entered this field of book writing first and provoked the fundamentalists to do the same, or *vica versa.* In 1913 J. C. Kimball published his "Romance of Evolution". Since the beginning of the war W. B. Riley presented his little pamphlet or tract, entitled "The Scientific Accuracy of the Scriptures," to which Dr. W. W. Keen refers in Science for December 11, 1925.

The biologist, in company with all other scientists, should always take the attitude of encouraging fair criticism of even his strongest theories. It is only by this means that science can progress and avoid stagnation. However when this criticism takes the form of bringing about legal restriction of scientific progress, it is time that a thorough examination of the evidence presented be made, in order that the voters and the law makers may be aware of its value. With this in mind the writer has read two or three of these new books against the theory of evolution, and presents below a digest of his findings.

The book on "Science vs. Evolution" by Sterling Price King bears the name of the Modern Science Press on its title page, though there is no such publishing company in existence. The author is an LLB; and the book purports to be an unbiased analysis of the situation by a disinterested party, who is neither a clergyman nor a scientist. It contains about 100 pages, and sells for a dollar in cloth, or half that amount in paper.

This book contains *prima facie* evidence of deliberate misconstruction of quotations. On page 11 is the statement, "Professor Olerich . . . . discussing this faculty of the atoms, says: 'They all eat'. etc. On page 50 the entire paragraph from Professor Olerich is quoted in which it is clear that animalcules and not atoms is the antecedent of "They". On page 54 Dr. Maynard Metcalf is quoted, "Psychology, whether of normal or diseased minds, must constantly remember the processes of evolution". This quotation is followed by the statement, "He takes the position that any psychologists who do not agree with the evolution halucination, have diseased minds".

In the chapter on "Geology vs. Evolution" strata of life are admitted to exist though without any relation to a sequence of time. The successive strata recognized are respectively as follows: bacteria; algae; carbon; nitrogen; sulphur; oxygen; calcium; germs; molecules; animalcules; man.

The presence of vestigial organs in the human body is accounted for, not as a recapitulation of ancestral characteristics, but as having a function in the embryo: the appendix as an organ of nutrition, replacing the stomach at that stage; the gill slits as a breathing apparatus of the embryo in its aquatic environment; and the embryonic hair as having a function similar to hair in plaster, namely to give firmness to the otherwise plastic substance.

In this book one finds such statements as these: "For more than 60 years the evolutionists have been trying to find some evidence that their theory is operating now, or has operated in the past. And to date not a word of actual evidence has been offered to sustain their contentions". "The evolutionists now deny that there was any Creator." "The real animus of evolution, and the incentive which produces the momentum of the movement, is the determination to overthrow Christianity and eliminate God".

The book on "The Sins of Science" by S. Klyce, is of quite a different nature. It is somewhat larger, and is written in a very ponderous style, which makes its reading very laborious. It is not filled with petty quibbling or with Phillipian epithets. The main point of contention is that the fault of modern science consists in its isolating nature into a multitude of discreet aspects, instead of amalgamating it into a common whole.

The volume on "The Dogma of Evolution" by Louis T. More is perhaps the most surprising of all. It is written by a physicist holding a position in a recognized University in one of the northern states. Furthermore it is printed by the Princeton University Press, and consists of 387 pages, and sells for $3.50. Strangely enough it attacks modern biological science because it does attempt to unify the universe into a composite whole. It supports a dualist philosophy, maintaining the entire independence respectively of matter and energy, living and lifeless, mind and body. It is indeed amazing for a modern physicist to base his criticism of another field of science on the lack of relationship between matter and energy, when the whole trend of modern physics is to explain matter in terms of energy.

In this book is found the following statement, "For nearly a century and a quarter, attention has been focused on the causes and the methods of variation, yet we have made no progress towards a solution." It is interesting to notice how similar is this statement to one made by Professor Bateson in his much discussed Toronto address in which he indicated the extent of the field yet to be worked in biological science. It is also interesting to notice how much this phraseology is like the statement quoted above from the book by King, which was published subsequently to this one by More. Thus we can speculate as to how a correct statement by a biologist like Bateson is misinterpreted by a superficial scientist, and his statement in turn is garbled by a carping critic in legal attire. Such is the evolution of anti-evolutionism.

Professor More's book contains many other statements which will doubtless prove excellent fodder for the fundamentalists. "What has hard humanitarianism, which is the logical conclusion from the thesis of the struggle for existence, done for the world? This is the familiar 'doctrine of the superman'. The Germans

. . . put the fallacious doctrine into practice. They plunged the world into war . . ." "All Evolutionists are conspicuous for their tendency to confuse religion with idolatry." "Sociology . . . has broken away absolutely from physics and biology; the path of human progress cannot be determined." "the evolution of man from the lower animals, which is purely a matter of guess". "The predominating trait of the leaders of evolution was an intense egotism and self-confidence." "to them (Spencer, Darwin, Huxley, Haeckel) belongs the credit of having, by ridicule, convinced us that the Christian Religion had encrusted itself with a mass of superstitious beliefs." "the cause of evolution and the method by which species vary—are metaphysical and unverifiable." "No study of the physical cell would predict that it could grow." Cell division may "be due to surface tension and not to vital action, but . . . the cause which directs primitive cells so that they, in one case grow into . . man, and in another into a tree, is not physical." "No biophysicist can examine a horse and tell us when it will move . . ., but a physicist can answer questions about a hobby horse."

The reading of such books as these may afford some amusement to biologists, but in the hands of the laymen they take on a more serious aspect. More goes so far as to attack the character of Darwin, Spencer, and Huxley. He fails entirely to discuss recent evidence and advances in the concept of evolution since their day, and brings modern evidence to bear against their theories, without fairly describing the modern modifications which biological science has made in the light of these advances. He contends that the acceptance of the theory of evolution necessitates the acceptance of a mechanistic philosophy, which in turn is atheistic, for he says, "To admit the existence of God in any sense of the word is to admit the possibility of the miraculous."

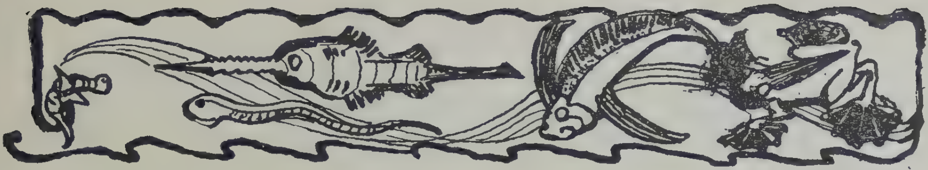
Biologists, it seems, should everywhere in America be aware of the information which is in the hands of the fundamentalists and be ready to give it a fair evaluation should the opportunity present itself. No type of evidence will in their hands be used so effectively as the statements of scientists and lawyers, such as those refered to above.

* * *

FLEAS

I think that I shall never see
A bug as lively as a flea
A flea that flies and flits about
And through your hair runs in and out
A flea too small for you to catch
Yet not too small to make you scratch
A flea that loves to romp and play
Upon your body night and day
A flea that nestles in your hair
And leaves a flock of Flealets there
Flies are caught by fools like me
But only dogs can catch a flea.

* * *



THE BIOLOGIST

OFFICIAL PUBLICATION, PHI SIGMA SOCIETY
PUBLISHED TWICE YEARLY, IN DECEMBER AND MARCH

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Editor and Manager
EVERETT F. DAVIS

Editorials

Mr. Carl P. Huber
Chapter Editor, BETA
Ann Arbor, Michigan

Boyce Thompson Institute
Yonkers, New York
April 16, 1927

Dear Mr. Huber:

The "Report of the Chapter Editor" has been accepted. There is no doubt but that it has received the unanimous approval of all who have chanced to read it.

You do not need to apologize for any delays which may have occurred in its preparation. This interesting narration of topics which customarily receive so short a squib in University catalogues shows a continuity of purpose behind it, a regard for accuracy in details, a breadth of academic contacts, and an appreciation for many of the fundamental efforts which your university is making to place opportunity before the biological students and investigators in this country, such that no comments of mine could help to make them appear more acceptable. It is a "Speak for yourself, John" proposition which is deserving of close scrutiny and a thoughtful review.

The society is, as a whole, grateful to you and to those associated with you, Mr. Huber, for having presented this digest of information regarding a noted institution which we have long wished to know more intimately.

Most sincerely yours,
Everett F. Davis
Editor, THE BIOLOGIST.

Undergraduate Research and Phi Sigma

THE question of undergraduate research is on trial before the faculties of many academic institutions in the United States and abroad today. Is it advisable to introduce in our university and college curricula the experimental methods for undergraduates? Posibly most of us would agree that this question as stated should be answered in the affirmative insofar as the spirit and the methods of research should permeate the biological laboratory. Surely the customary place to begin to prepare for future leaders of research is on the Freshman's battlefield, the afternoon laboratory from one o'clock until four.

But to deliberately encourage *experimental investigation* quite outside of the organized laboratory, or to permit students who will to do so, to concentrate their efforts in biology upon some phase of an original piece of research work during undergraduate years, is in the opinion of many, a sin which too frequently is committed by our professors.

To bring the question to our own front door,—is it ever desirable for Phi Sigma to go on record as encouraging in any degree undergraduate research? Or, is it much better for us, either, to remain off the records that stand clearly opposed to such an incongruous practice?

Relations Between Faculty and Students

POSSIBLY there is no subject dealing with college and university problems which is so timely or of greater interest to the majority of the faculty members of our American institutions than the experiments which are being conducted at the University of Wisconsin. There, small groups of students have been literally selected for experimental purposes. The sole purpose has been to bring data together in the solution of certain problems bearing on college administration.

Experimentation in the field of the intellectual and social welfare for students has already begun. Pres. Clarence C. Little, a distinguished member of our society, a biologist of renown and president of the University of Michigan, has recently voiced the sentiment that the faculties of our large universities should be subject to similar analysis. The following has been quoted from a speech by him which has been published in the Association of American Colleges Bulletin, May, 1927.

"When we want to find out the nature of our student body socially we must isolate it in smaller groups than we are now using, and when we want to find out its nature individually we must try to isolate the individual mind and find out about that.

"That will mean long and arduous *research*, and it will mean research from the point of view of both faculty and students. It will also involve the recognition that they are both of them being studied in a spirit of friendship and in a spirit which has as its aim the reconciliation of their points of difference. An ultimate cooperation between them will be of very greatest value. The students have enjoyed an immunity from that type of analysis,

(Continued on page 36)

Initiated Group at Montana State

History of Phi Sigma Beta

Chi Chapter of Phi Sigma

ACTING upon a suggestion offered by Professor Cotner, an alumnus of Phi Sigma and a member of the faculty, a group of students in the biological sciences decided to organize an honorary biological fraternity in the spring of 1925. Professor Cotner outlined the benefits to be derived from such an organization. The local fraternity was named Phi Sigma Beta, and at the first meeting it was decided to petition the national society, Phi Sigma, as soon as the group had reached sufficient size and prestige. This was the first big goal towards which every member strove. On June 2, 1925 the faculty of Montana State College gave formal recognition to the organization.

The meetings were opened the next fall with all the charter members back with the exception of two. Honorary members were chosen from the faculty, and several students were elected from the incoming junior class. At our regular business meetings various reports are given on scientific interest and value. Faculty members also contribute to the programs with addresses, and outside speakers are brought in. Among these latter was Mr. P. H. Hawkins who has contributed an article on "Grasses". His extensive travels and studies along this line had well prepared him for an address upon this subject.

After a time active steps were taken to the preparation of a petition to be sent to Phi Sigma Society. The school year closed without further work by the organization.

Meetings started off with the beginning of the 1926-1927 year, in the fall. These were continued along the same lines as were those of the previous year, except with even more enthusiasm being shown toward the possibility of being granted a chapter in Phi Sigma. An inspection made by Dr. J. E. Kirkwood of the State University at Missoula was held in October. Before a meeting of the local groups Dr. Kirkwood gave a talk on the aims, purposes, qualifications for membership, and the constitution of Phi Sigma. Individual conferences were held by the inspector with each member of the local Phi Sigma Beta.

Word finally came from Phi Sigma that we were granted a charter as Chi chapter, and communication was held with Dr. Kirkwood, the installing officer, as to possible dates for the installation. The installation of Chi chapter was held on February 11, 1927.

At 4:00 o'clock on the above date, a meeting of the society convened with

President Cummins in the chair. After roll call, to which about 20 members responded, the meeting was turned over to the installing officer, Doctor J. E. Kirkwood. All were asked to rise while the ritual was read. The company then resumed their seats while Professor Kirkwood gave a talk on the aims and purpose of Phi Sigma, stressing the importance of research, its methods and objectives, pointing out also the policies that should guide the chapter in order to keep its membership strong, active and progressive.

Mr. Cummins, as president, then responded with a brief speech of acceptance, after which the meeting was adjourned.

At 6:30 o'clock, the company again assembled for the dinner at Kendrick Banquet Hall, with Mr. Cummins presiding.

At the conclusion of the banquet Doctor Kirkwood presented a paper entitled "Botanical Field Work in Montana." This paper presented a brief sketch of the past history of botany in Montana, followed by a careful outline of the future work to be done along systematic and ecological lines in the northern Rocky Mountains. The paper presented in an attractive way the opportunities for research in the region and pointed out specifically, problems within the reach of the young investigators, especially of such as constitutes the student membership of Phi Sigma.

The concluding event of the day was a group photograph at Schlechten's Studio.

Relations Between Faculty and Students

(Continued from page 34)

due to their great numbers, and the faculties have largely enjoyed an immunity due to the great height of mental achievement which they have reached. Neither of these conditions is fair. It is not right to leave our students in masses without attempting to find out the basis for the differences that exist, and to utilize those differences intelligently. Nor is it fair to faculty members to pretend that they are all 'born free and equal', because they are not. The students will determine the truth of the latter statement even if we who are interested in administration do not.

"Now what kind of a criterion can we use to test both our faculty and our students? We certainly cannot apply the same mental test to both. There is a somewhat general term which I think has not been very much abused and which has been very helpful in analyzing the situation. The term is 'opportunity'.

"There are five phases of opportunity that apply equally to all of us and to our faculties and to our students, and they come in a fairly logical sequence. The first is to make sure that there is a desire born in the minds of all concerned *to hunt for opportunity,* in other words never to be wholly satisfied with the existing order of things.

"*To know when you have found it* is the second step. These two steps

(Continued on page 38)

A Digest From the Philadelphia Convention

MONDAY, December 27, 1926, President Cutler opened the convention followed by a few words of greeting and then called for the reports of the National Officers. These reports were followed by those of the delegates who were in attendance from respective chapters, as follows:

Beta	A. F. Roe
Delta	Swift
Epsilon	Krueger
Zeta	Weed
Eta	Pittinger
Theta	Romaine
Iota	Lucas
Kappa	Allen
Lambda	Miss F. Touts
Mu	Thomas
Nu	Cooper
Xi	Williams
Omicron	Smart
Pi	Sturdivant
Rho	DeCoursey
Sigma	Watkins
Tau	Thompson
Upsilon	Creager
Phi	Miss F. Smith

The rest of the morning was filled by a report from the Chairman of the Ritual Committee which led to a general debate in which many delegates expressed their chapter's and their personal opinions upon the merits and demerits of the simple impressive, formal, informal types, as well as the advisability of modifying the existing ritual.

Chairman Keefe was instructed by vote to draft a simple but impressive ritual as well as a more formal ritual to be used by the chapters in their initiations, quite at their own discretion.

The convention adjourned to the Hotel Bartram at 12:30 P. M. to enjoy a luncheon and a mid-day siesta.

A scientific program took the place of afternoon business and between the hours of 2:00 and 3:30 o'clock, the following papers were read and discussed:

Business was again resumed and it lasted until 6:00 o'clock. Doctor C. I. Reed was re-elected to serve the Society for another term of office. Doctor A. M. Keefe was elected to fill the vacancy left by vice-president Lowell E. Noland who resigned following the completion of a term in office.

The acting secretary for the convention, Miss Smith, reported upon *Alpha* chapter that it did not seem ready to reorganize. The results of the chapter vote upon Bozeman, Montana was read and it received popular approval.

Editor Davis proposed a new article to the Constitution defining the scope of the policy of THE BIOLOGIST and listing provisions for its performance. The convention decided to vote these recommendations in the form of a permanent policy of the society but not to incorporate them as part of the Constitution.

The convention voted that a scientific program be presented next year at the A.A.A.S. meetings held at Nashville, Tennessee; that the National Council should be instructed to meet at this time, their railroad expenses to and from Nashville to be paid by the organization.

The convention adjourned without accomplishing further business at 6:00 o'clock, December 27.

Relations Between Faculty and Students

(Continued from page 36)

are preliminary and lie at the base of the other three. If we could be sure that at the end of the first two years of college we knew which students had developed an undying desire to hunt for opportunity mentally and to recognize it when they found it, we should have material for a far better group of juniors and seniors than we have today.

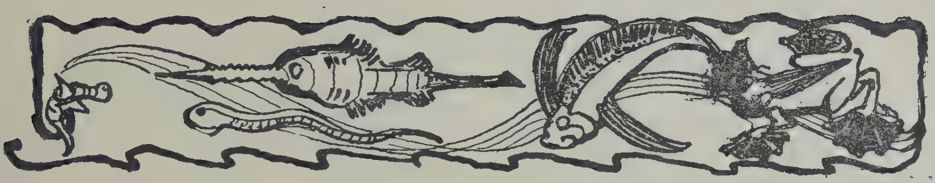
"The third step, after having hunted for and learned how to recognize opportunity is *to evaluate it,* to have a basis of comparison, to separate accurately the wise from the unwise, the old from the new, the temporary from the permanent, the constructive from the destructive, in the various problems which come up mentally.

"We should *look for, recognize,* and *evaluate* opportunity—*then use it.*

"The fifth and last step belongs to the exceptional student and to the exceptional faculty member, and that is to create opportunity for others. *If you look for, recognize, evaluate, use and finally create opportunity,* and if it becomes known that the common efforts of administration, faculty and students lie along that line, I believe that you have a basis on which you can build cooperation.

"There will be three general groups of students and faculty; a lower, a medium, and a higher group—an inferior, an average, and a superior division. We should treat the three groups very differently. We should look for and eliminate the lower group in a little bit more gentlemanly way than we do at present. The effort to make the first two years of college different from the last two, and the effort to arouse the search for opportunity, and the recognition of opportunity in the first two years, give us a fair way of getting rid of the inferior student.

(*Continued on page 46*)



Report of National Secretary

Needs of the Society Discussed

I FULLY realize, in reading over the report of proceedings of the Convention as prepared by the stenographer, that there must have been many things that are not apparent from the report. But a careful perusal of the latter gives me several impressions which I should like to emphasize to all readers of THE BIOLOGIST. My first distinct impression was of the earnestness and sense of responsibility displayed by the delegates. It is a pity that *all* members of Phi Sigma could not attend a Convention. Those who were absent certainly missed something worth while. I was especially impressed with this in the first two Conventions as well as with the high quality of the delegates selected, upon which the chapters are to be congratulated.

The Spirit of Phi Sigma is WORK!

I note that one delegate, in his report, made mention of the fact that in his institution, Phi Sigma is becoming recognized as a society in which one has *to work*. It is a sad commentary on college life that there are in existence so many so-called honorary societies in which no one does anything after becoming a member. If Phi Sigma can successfully establish a reputation for *work*, a long step will have been taken toward elimination of an undesirable element that has been the curse of this society since its foundation — the student who proudly displays honors but is never on hand when anything worth while is to be accomplished, or is too busy with "campus affairs". This type is present in every institution and has in greater or less proportion made up a "bloc" in the chapter roll. In two notable instances this individual has worked serious damage to chapters, besides being a continual source of worry to officers, both local and national. Phi Sigma can accomplish only by *work*.

The Problem of Presenting Petitions

I note further that some criticism was voiced concerning the policy of the Council in presenting petitions to the chapters. The chapters may rest assured that the Council will exhaust every means of securing information concerning a prospective group before making a recommendation to the chapters. In most cases, to present each chapter with a complete copy of this information would be wholly impractical for much of it is obtained, not directly from the petitioning group but from other sources, which vary with each case. In one recent case, to have required the petitioning group to present complete copies of their material to each chapter would have entailed additional cost of nearly $100.00. Such a demand is unfair and unreasonable. The present plan has apparently satisfied most chapters, for rarely has there been a call for additional information. The Secretary fully realizes that the present petition forms are not entirely satisfactory and is engaged in the preparation of a new form, in recognition of the fact that no chapter is obliged to vote on a petition until fully satisfied on all points of information that have any bearing on the desirability of the petitioning group as a chapter.

There are various methods of eliminating undesirable groups without taking official action and about 20 such have been so eliminated in the past seven years. If there is any possible chance of the group qualifying then the case is allowed to come up for official consideration. That this is not an unwise plan is evidenced by the fact that only twice have the chapters failed to act according to the official recommendation of the Council, and then only temporarily. This, by the way, is a mark of confidence in the judgment of the Council that is highly appreciated by every member.

A Challenge to Us All

Without desiring in the least to detract from the merit of the work done by the ritual committee, it appears to me that a disproportionately large amount of time was consumed in the Convention in considering the question of the ritual. That is an important problem but by no means a basic or fundamental one. Phi Sigma is, and will continue to be recognized by the scientific world by what it accomplishes and not by its coat-of-arms or by its ritual. Our real problem is, how may we best accomplish scientific results, and not how we shall satisfy the momentary tastes of those who do or do not like our ritual. For the individual desires *are* but momentary and will assume progressively less importance in the eyes of the initiate from the moment he or she becomes a full-fledged member—*provided,* there has already been inculcated any real spirit of service in science. The extent to which each chapter instills this spirit into the novitiate is going to determine whether a real initiation has taken place.

I have, from the beginning, recognized the defects in the present ritual but have consistently refused to allow consideration thereof to divert me for one moment from the real problems at hand. If a chapter fails to instill the ideals for which Phi Sigma stands, into the minds and emotions of its initiates then that chapter has failed signally in extending any real initiation, no matter how impressive may be the ritualistic form employed. Personal experience leads me to conclude that this may best be accomplished by the exemplification of these ideals by the officers and members of the individual chapter. Have a ritual, if the majority desire it, but by all means keep before the members the ideal of true scientific service. Our slogan should be, "A research problem and the means of pursuing it, for every member of Phi Sigma." Again from personal experience and observation, I believe this ideal should stand regardless of the professional interests of the individual in the various applied fields of biological science.

A Scientific Program at Nashville

Another point that impressed me was the readiness with which the Convention voted for a scientific program to be presented at the Nashville meeting. In the face of advice to the contrary, it was decided that a program should be presented, in spite of the fact that most of the papers that have been presented before the two scientific sessions, have been presented by delegates or officers whose major expenses were paid.

The Convention voted this problem upon the Council and the latter will strive to fulfill the desires of the chapters. But it rests with the chapters to produce the material from which the program is to be built and furthermore to see that the material reaches Nashville. So far only one chapter has responded to the appeal sent out by me some time ago. I fully realize that it may be too early to expect a positive response. But each chapter must be constituted a special local committee to hunt up material and see that it gets to Nashville for presentation. Otherwise the Council is powerless for we cannot *create* a program.

I wish to take this opportunity to thank the Convention for its expression of confidence in returning me to the office of Secretary. With the cooperation extended by the chapters and by my colleagues on the Council, I am glad to continue to serve Phi Sigma to the extent of my ability, even though it had been my hope that someone would be found who would be willing to embark on a career of such service and who could render a more efficient service than I have been able to do.

Grads Prove Archeology Good Field

Frank and Henry Roberts Win National Honors in Field

That archæology is one of the most enticing and opportune fields open to college students and graduates has been proven by the unusual success of Frank and Henry Roberts, both graduates of the University of Denver, and now in outstanding positions in the field, according to Professor Etienne B. Renaud, head of the departments of anthropology and romance language here.

Both Frank and Henry Roberts are young men under thirty, yet information has recently been received that the former has been appointed to head the archæology staff in the Smithsonian Institute at Washington, D. C., while his brother sails soon on the Carnegie expedition to Yucatan in the position of assistant archæologist.

Position High

The position that the elder Roberts now holds is one of the highest honors open to those in this field, Renaud points out. In his position Frank will head expeditions as well as take charge of classification of all archæological material gathered by Smithsonian workers in North America.

Henry Roberts, member of the class of 1926, sails January 5 for Yucatan, according to word received here Tuesday. He will make his headquarters at Chichen Itza, Yucatan, site of the largest ruin of Maya civilization. His work will consist of excavation and restoration of the ruins. Dr. Griswold Morley, famous anthropologist, will head the expedition, while Earl Morris, a Colorado man, is in charge of the field work.

Success Assured

"All that is required for success in the field from any college man is good health, a strong body, perseverance and the ability to take care of himself when left on his own resources," Professor Renaud says. "The field is undersupplied with good material, yet wages are high and the work is interesting." Although the work at first might seem dry, the professor points out that there is nothing more interesting than digging out and reconstructing lives of ancient peoples.

The work in Yucatan will be in connection with the Maya civilization, which dates back to the time of Christ. The Mayas were contemporary with the Aztecs, Renaud states. Aztecs were a fighting race and eventually they dominated and conquered their republican, artistic neighbors.

Both the Roberts were graduates of the University with a bachelor of arts degree, while Frank has already received his A.M. Frank Roberts has completed the majority of work for a Ph.D. degree at Harvard and award of it awaits completion of his thesis, which will be based on his experiences in Chaco canon, New Mexico. Henry

(*Continued on page 45*)

The Biologist

Permanent policy as voted upon by the 1926 Convention

THE official publication of the society shall be known as THE BIOLOGIST. It shall be edited and managed in accord with the spirit and purpose of this constitution and this society and with the following provisions made for its performance.

1. An Editor who will manage and edit THE BIOLOGIST shall be elected from active membership within the society by a vote of the National Council in conjunction with the existing editor in office.

2. The Vice-President shall represent THE BIOLOGIST on the National Council and shall willingly assist the Editor as it shall seem advisable to do so.

3. The Editor shall provide for the complete preparation and delivery of each issue and may arrange to have:

(a) an assisting editor in each chapter with his or her corresponding duties;

(b) an advertising manager to secure advertisers and to arrange for all advertising space. He shall be held accountable to the Editor and the National Treasurer for all advertisements and all money which result from business transactions. He shall receive a commission for his services.

(c) Typist's assistance in the preparation of the copy and correspondence relating to THE BIOLOGIST, and assistance in the delivery of the orders.

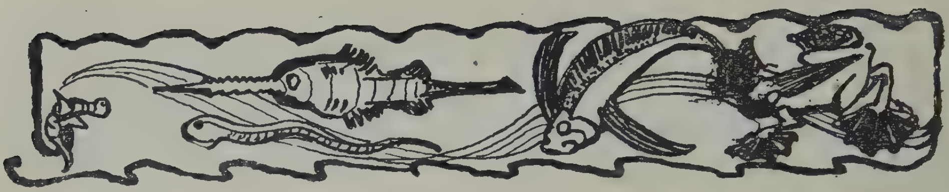
4. The Editor shall render to the Secretary a report covering all phases of his activities for each ensuing year.

5. The book shall be edited according to the specifications used by the W. H. Kistler Stationery Company, in the preparation of volume VIII number 1, or until such specifications or printer shall be modified or changed either upon demand from or approval of the National Council.

6. (a) THE BIOLOGIST shall be financed from a fund in the National Treasury known as THE BIOLOGIST FUND, into which fund each active member shall pay yearly one dollar ($1.00) whereupon the said individual shall receive one year's subscription to the magazine. See By-Laws, as amended in 1925, Sec. 1. (a).

(b) Imbursements from all other sources shall be credited to a fund known as THE BIOLOGIST RESERVE FUND, which shall accumu-

(Continued on page 45)



New York University

Biolog - Club

In order to furnish all readers of THE BIOLOGIST with some appropriate information in regard to prospective and petitioning College and University groups, the editor is going to establish a precedent and mention briefly a few of the outstanding impressions received from a visit to the Beta Lambda Sigma club on New York University Heights.

THE DEPARTMENT

Biology on the campus consists in the following courses with a total enrollment of about 280 students. The courses are *undergraduate,*—General Biology, Comparative Anatomy, Histology and Embryology, Microbiology, Bacteriology, Faunistic Ecology, General Physiology, General Entomology; graduate, — Experimental Histology and Embryology, and Parasitology. There are 274 undergraduates and 5 graduate students, of which number 4 are actively engaged in research.

At present the staff consists of the following:

H. W. Stunkard, Ph.D., Illinois, whose research field is Parasitology; A. B. Dawson, Ph.D., Harvard, whose field is Histology; R. P. Hall, Ph.D., California, Protozoology; F. L. Campbell, Ph.D., Harvard, Entomology and General Physiology; C. H. Willey, M.S., New York University; P. T. Hart, M.S., Columbia, Animal Ecology; F. Yaeger, M.S., Columbia, Physiology.

The Department has affiliations with the Brooklyn Botanic Garden and the American Museum of Natural History, where in the case of the latter, Doctors Stunkard and Dawson are Associates.

They are housed in a stone building which has been vacated by the Department of Chemistry. This will help them considerably inasmuch as the staff has been embarrassed by inadequate floor and office space and by a lack of rooms to carry out research projects efficiently.

The library contains a sufficiently large number of texts, charts, and reference books for the size of their classes. Much money is being spent to increase the number of scientific periodicals and journals.

THE LOCAL GROUP

This consists of seven active members with several of their number engaged in research projects within the department. Under the enthusiastic leadership of Professor Dawson, reorganization occurred a year ago along the following lines:

Meetings:

Monthly meetings are held at regular intervals where topics suited for seminar and discussion are presented by the members, three usually reporting during the hour. The faculty is instrumental in arranging the topics for the program, and in leading the discussions. They aim to have the subjects relate indirectly and sometimes directly to the research activities of the department.

To vary their programs, a dinner night is held during each semester, and reports of the research being undertaken by the students is heard and discussed. A freshman night is also held at an early date for the purpose of acquainting them both with the biologists and the fields which they represent.

The attendance is on the average from twenty (20) to thirty (30), I am told. From so large an attendance it at first appears unusual that so few are active members. It was suggested that the reason for this is mainly due to the fact that a very select group is elected to membership. I am told that the faculty publishes a list making eligible for membership all those who have a B+ scholarship average, or better, in the University and from this list there is elected only those persons who are known to have some real inclination to major in the department and lead in biological research.

This excludes a very large group who are taking biology courses as prerequisites for further medical courses.

Feeling toward Nationalization:

From what I was able to learn, the group seems sincerely interested in Phi Sigma Society. The initiation fee of $100.00 looms large before so few *active members* and is enough to prevent their petitioning our society for the present.

Grads Prove Archeology Good Field

(*Continued from page 42*)

Roberts was working on his A.M. when the offer of a position came up and he decided to take it. It is expected he will use his findings as the basis for his master's work.

Both the Roberts are members of Epsilon Chapter of Phi Sigma.

—*From Denver Clarion, Jan.* 6, 1927

The Biologist

(*Continued from page 43*)

late for the future enlargement of THE BIOLOGIST.

Amendment to By-Laws

Subscription rates shall be as follows:

1 year subscription	$ 1.00
3 years subscription	2.50
5 years subscription	4.00
10 years subscription	7.00
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Single copy	.50
Copies in lots of ten or more	(.25* (.35*

*The amount to be charged shall be optional with the Treasurer, but shall depend upon the purpose for which the copies are intended.

Relations Between Faculty and Students

(Continued from page 38)

“We know that there are faculty members who like nothing better than to deal with uninformed and immature students and to try to arouse their interest and make them recognize their real opportunity. Those men should be brought in contact with the freshmen and sophomores; those men should be recognized as being different from the type of faculty member who by the weight of his own intellect, by his own power, has driven deep into the field of research and who is busy pushing human knowledge in some field or fields. The latter type of man should have his material picked for him, he should not be brought into contact with freshman, he should be brought into contact with juniors and seniors who have passed an elimination test, whose interest has been aroused, and whose desire to recognize opportunity when they see it is already admitted.

“For the average student, the medium, the ordinary individual *‘use’* is the keynote. We have a right to *use* him, we have a right to study him, we have a right to see what his potentialities are, . . .

“The *exceptional* student should have our *cooperation*. The *exceptional* student, I think, should be picked out of the system wherever you find him and an individual course planned for him.

“We shall, also, I think, find more and more faculty men who realize that the only children that they leave after them mentally, in addition to whatever their own small families may be—to inherit the earth are not a text book, are not a laboratory equipment, or a few pieces of research alone, *but the living students with whom they come in contact.*”

THE BIOLOGIST

Vol. IX MAY, 1927 No. 1

Some Studies in the Purification of the Female Sex Hormone

DR. REUBEN G. GUSTAVSON AND HUGO KRUEGER *(Epsilon)*

(Abstract of paper read at Philadelphia Convention)

The female sex hormone is the name given to a chemical compound made by the ovaries; thru the manufacture of this compound the ovaries control the general growth of the female productive system and breasts. At the Univ. of Denver it was found that this hormone was soluble in liquid ammonia. Furthermore, the work of Frankland regarding the insolubility of Cholesterol in liquid ammonia was confirmed. Thus liquid ammonia can be used to separate the hormone quantatively from cholesterol, one of the impurities commonly associated with the hormone. Liquid ammonia extracts of crude preparations of the hormone are about 36 times as active as the crude preparations. The use of liquid ammonia also offers a satisfactory convenient method of obtaining a fairly pure water solution of the hormone.

This work was in part carried on by a grant from the National Research Council.

—Abstracted by Hugo Krueger, March 1927

Dept. of Physiological Chemistry, University of Denver.

The Use of Black Agar as a Culture Medium

HAROLD G. CASSIDY *(Eta)*

(Abstract of paper read at Philadelphia Convention)

A brand of black powdered carbon (Difco Decolorizing Bone Charcoal) has been used by the author with singular success to bring out the finer morphological characteristics of bacterial colonies against an opaque background when grown upon agar slants.

This medium is useful when the colors of the nutrient media and the bacterial colonies are very similar.

It is recommended that agar tubes be prepared and sterilized in the usual manner and that they be emulsified with a small amount of black carbon powder while they are still in the liquid state. This can be accomplished by rotating the tube rapidly between the palms of the hands. Following this a still gelatin slant is made before the black pigment is able to settle out by solidfying the contents of the tube with running cold water.

The presence of the bone charcoal does not appear to inhibit bacterial growth.

—Abstract by Everett F. Davis, March 1927

Dept. of Bacteriology, University of Akron.

Observations on the Fresh Water Sponges of Wheelwright Pond, Durham, New Hampshire

DOROTHY TUCK SMITH *(Phi)*

In the course of an extensive ecological survey of Wheelwright Pond, Durham, New Hampshire, some of the common species of fresh water sponge were found growing to an enormous size. The factors involved in this abnormal growth and the ecological conditions surrounding the sponges of this region will be discussed. The purpose of this work is to determine the nature and effect of pollution on the aquatic fauna of the state.

Dorothy Tuck Smith, March, 1927

Dept. of Biology, U. of New Hampshire.

Spermatogenesis in Culex Quinquefasciaters

HARWELL P. STURDIVANT JR. *(Pi)*

Maturation in the Clex mosquito takes place during the larval and pupal stages. There is no positive correlation between the age of the larvae or pupae and the stages of maturation found.

The spermatogonia which are found in the very young pupae or old larvae have a large nucleus with a comparatively large nucleolus which stains dark. The latter is embedded in a very fine net work of chromatin-like granules which in later stages condenses to form the spirene. The spirene thickens quickly and shortens to form paired chromosomes.

During this time the nucleolus loses its affinity for haematoxylin stains and finally disappears. After cell division the nucleolus forms immediately. At this stage it is embedded in the fine spirene threads but does not give evidence of connections with them. As the chromosomes are formed it again disappears.

While the secondary spermatocytes divide one or possibly two darkly stained bodies appear which may appear until the spermated nucleus has elongated considerably.

—Abstracted by H. P. Sturdivant, March, 1927

Dept. of Biology, Emory University.

A Preserving Fluid for Green Plants

ANSELM MAYNARD KEEFE *(Zeta)*

(Abstract from Science LXIV: No. 1657, 331-332, 1926.*)*

The preparation of museum specimens of pathological plant material by the copper acetate method has been modified to use with a general fixing fluid to preserve most plant forms in their natural color.

The most satisfactory results were obtained with chlorophyllous plants (other than marine algae) when copper chloride was used together with uranium nitrate. None-chlorophyll bearing plants such as the fleshy basidiomycetes and other fungi can be preserved indefinitely in the colorless stock solution to which no copper or Uranium salt has been added.

The following complete formula was used:

50 per cent alcohol	90	cc.
Commercial formalin	5	cc.
Glycerine	2.5	cc.
Glacial acetic acid	2.5	cc.
Copper chloride	10	gm.
Uranium nitrate	1.5	gm.

The method can be used to advantage when the green plant materials are to be preserved for class use by sealing them in large specimen jars containing the complete formula, or as the author suggests when it is desired to make herbarium mounts. The specimens will withstand fading.

Comments:

In this paper there is no mention of the application of heat to the reaction, which application is necessary when one attempts to carry out the chemical reaction involved with chlorophyll in an acid medium. The variegated leaves of Abutilon Thompsonii have been preserved in color very successfully by heating them in the solution at 100° C. for 2 hours. Furthermore, it is not stated how one should proceed to transfer leaves from a solution containing 50 per cent alcohol to herbarium sheets for mounting purposes unless it can be assumed that complete hydration of the leaf material is again necessary before the mounts can be properly dried in air.

Copper acetate and uranium acetate have been effectively substituted for copper chloride and uranium nitrate when the lack of either salt demanded it. However, the combination of copper chloride and uranium acetate is not recommended for the uranium has been found to precipitate from solution when heat is applied, with the result that it is useless in counteracting the blue color of the copper ions since it will not penetrate into the leaf tissues and precipitate there beside the copper.

—Abstracted by Everett F. Davis, March, 1927

Dept. Botany, Marine Biol. Laboratory, Woods Hole, Mass.

New Species of Diaptomus from the Philippine Islands

STILLMAN WRIGHT *(Zeta)*

(Abstract of paper read at Philadelphia Convention)

A. This species, *Diaptomus insulanus,* is the first of the genus to be reported from the Philippine Islands. It can be readily distinguished by the peculiar armature of the second basal segment of the right fifth foot of the male.

The following new species have been also described: *Diaptomus merrillae, D. perelegans, D. pearsei, D. santaremensis, D. insolitus, D. calamensis, D. flexipes, D. coniferoides, D. silvaticus, D. silvaticus infrequens.*

A Revision of the South American Species of Diaptomus.

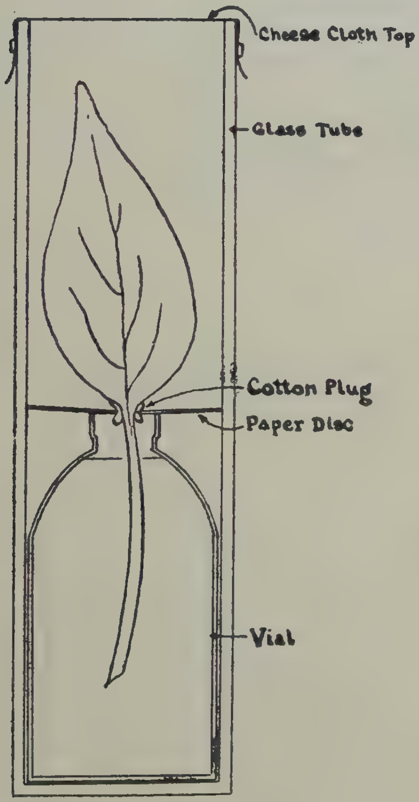
B. A review of the literature shows that fourteen species of Diaptomus have been described from South America. Two of these duplicate previously reported species. This paper describes nine new species and one new variety in detail and gives short descriptions of the others. There are nine plates of drawings. All species are endemic with the exception of *D. marshi.* The genus is restricted to the Brazilian sub-region excepting a small area near Buenos Aires. In the Chilean sub-region Diaptomus is replaced by Boeckella, Pseudoboeckella, and Parabroteas. The South American species do not show close relationship to those of other areas.

—Abstracted by Stillman Wright, March, 1927

Dept. of Zoology, University of Wisconsin.

An Insect Rearing Cage Adapted to Space Economy

ALFRED WEED *(Zeta)*



Sketch of Rearing Cage

During the past two winters in which life history studies have been carried on two species of aphids in chambers in which the temperature and humidity have been controlled, and where economy of space has been necessary, the illustrated rearing cage has been found quite satisfactory.

The few materials needed for its construction are available in any laboratory; and with but very little practice the student may become quite efficient in the transference of the species concerned, the introduction of fresh host tissue and the addition of water or a nutrient solution. The cage makes possible the study of numerous individuals in a minimum amount of space; and may readily be altered to provide a chamber for the growth of the host plant under sterile conditions.

The cage in question consisted of a flat-bottomed glass tube, an inch to an inch and a quarter in diameter and four to five inches in height. A glass vial was used which fitted snugly into the tube to accommodate water or the nutrient solution. If such a vial is not available, a smaller size can be used, and the space between the vial and the tube may be packed with cotton. Discs of paper, preferably black, were cut to fit tightly into the tube. These were slit to the center and a small perforation was made to accommodate the stem of the leaf or the cutting on which the aphids were being reared. The black paper used in the wrapping of photographic plates serves the purpose excellently. A cheese cloth top, held in place with rubber bands, completed the cage.

Tap water has been used in the vials for the maintenance of the host leaves, and has been found to fulfill the requirements, when changes of the host plant have been frequent. The cutting of the stems under water is advocated, as it prevents air from entering the conductive vessels, a factor in producing wilting. Leaves of spinach and cuttings of alfalfa and peas have served very well as host plants for rearing aphids in cages of this type.

Large sized flat bottom test tubes have been employed with success; and several of them can be fastened together with rubber bands so as to keep them in an upright position, or many of them may be packed in a wire basket. A dozen cages of this general form may be grouped together where the same amount of space would accommodate but a single cage of the battery jar type, or at most two ''lamp-chimney'' cages; and in chambers where the economy of space is essential they are highly advantageous, giving results which are entirely satisfactory.

THE GRIST WE GRIND

References to articles published in other journals by memebers of PHI SIGMA.

Cunningham, Bert. Heredity. Duke University Press, Durham, N. C. 1926. (Tau)

Holl, F. G. Functions of the Swimbladder of fishes. Biological Bulletin vol. 47, no. 2, 1924. (Tau)

Holl, F. G. The influence of asphyxiation on the blood constituents of marine fishes. Jour. Biol. Chem. vol. 67, no. 3, 1926. (Tau)

Holl, F. G. The vital limit of exsiccation of certain animals. Biol. Bull. vol. 41, no. 1, 1922. (Tau)

Holl, F. G. A method for the determination of dissolved carbon dioxide. Jour. Biol. Chem. vol. 55, no. 4, 1923. (Tau)

Titles of papers reported in progress of completion by members of PHI SIGMA.

U. of Akron ETA

Clarence Witzberger—Cultivation of tissues in vitro.

Harvey Karam—The synthesis of adrenalin.

William Pittenger—Morphology of bacterial vaccines and the effect of sterilization on them.

Carl Figenscher—The prostatic anatomy of the dog.

Harold Cassidy—Study of the food of *Opsopoeodus Emiliae.*

Arthur Dobkin—A study of the food of *Abramis Crysoleucas.*

Louis Sheinin—The synthesis and toxicity of salversan.

Paul Zimmerman—The progress of medicine in the 18th and 19th centuries.

Ethelyn Barber—Studies on normal and pathological throat flora of the Akron district.

Ruth Koons Blake—A study of the diphtheroid flora of the Akron district.

Dr. Walter Kraatz—A study of the food of the blunt nosed minnow *Pimephales Notatus;* and a preliminary general survey of the biology of the Portage Lakes.

R. D. Fox—Investigations on the bacteriology of goiter; pleomorphism and pathogenicity of diphtheroids; and morphology and cultivation of gonococcus. The last in collaboration with H. J. Gordon of the United States Public Health Service.

Dr. H. Hottenstein—(with Dr. W. O. Klingman)—Purpura Hemorrhagica complicating pregnancy, in the American Journal of Obstetrics and Gynecology.

Duke U. TAU

W. R. Ellerson—The effect on the young in utero of certain glandular secretions in the blood stream of the mother.

F. J. Holl—Physiological changes during desecation.

Dean W. Rumbold—Physiological effect on some poikilothermic animals during starvation.

Voris A. Matheny—A study of parthenogenesis in the Arthropods.

Nola Jane Gentry—The effects of various vapours on development of the hen's egg.

Dr. H. L. Bloomquist—Is working on the Liverworts of North Carolina.

Dr. Bert Cunningham is continuing research on effects of pressure on incubation of hen eggs.

N. F. Wilkerson is engaged in research on ecology of Dioneae Muscipula.

U. of California MU

A BACTERIOLOGY AND HYGIENE

Miss M. I. Beattie—Problems in diphtheria.

Dr. J. N. Force—Additional studies in smallpox.

Mrs. E. Lucia—A study of diphtheria mortality in the 0-4 and 5-9 age groups; registration area for deaths.

Bernice Eddie—(with *Dr. Force*) The relation of viricidal substance to the cutaneous smallpox immunity reaction.

Evelyn Lewis—The immunization of rabbits with *Botulinus anatoxin.*

Salvadore Lucia—A study of the leucocytes of guinea pig blood. A preliminary report on a statistical study of leucocytes in guinea pigs to be published in Proc. Soc. Exper. Biol. and Med.

B BOTANY

Dr. Lee Bonar—Physiology of fungi and life history studies in the Ascomycetes.

(With Holman and Roush) A laboratory guide for a course in general botany.

Dr. T. H. Goodspeed—Cytology of hybrid plants and genetics, with special reference to *Nicotiana tabacum.*

Dr. H. M. Hall—Monograph of the genus *Happlopappus;* in preparation.

Transplant experiment work in California and Colorado with the view of determining constancy of plant characters.

Dr. R. M. Holman—The culture of filamentous algae, particularly *Oedogonium* under controlled conditions, and the study of conditions favoring reproduction.

Pollen longevity.

"Fatigue" of chloroplasts.

Dr. W. A. Setchell (with *Dr. N. L. Gardner*)—Marine algae of the Pacific coast of North America.

Kathleen Drew—Research on the genera *Chantransia, Acrochaetium,* and *Rhodochorton.*

Recent publications on: (1) An abnormal pro-embryonic branch of *Chara vulgaris;* and (2) The "leaf" of *Nitella opaca* and adventitious branch development from it.

F. H. Frost—Flora of Rancho La Brea.

Identification of leaves by statistical methods.

J. T. Howell—Systematic studies in the genus *Lessingia.*

Herbert L. Mason—Tertiary records of some west American endemics.

An experimental study of the genus *Dodecatheon.*

Plants collected on the expedition of the California Academy of Sciences to the Revillegegidos Islands.

The North American Polemoniaceae.

Margret E. Myers—Contributions toward a knowledge of the life histories of the Melanophyceae. Recently published.

Life history and cytology of *Egregia menzeisii.*

Lucille Roush—Melobesieae of the Pacific coast.

Irma Schmidt—Distribution of hardwoods of California. Recently completed.

Seed production and germination and seedling characteristics of California species of *Quercus*.

Lauramay Tinsley—A revision of the Californian species of the genus *Lepidium*. Recently completed.

C ENTOMOLOGY

Prof. C. W. Woodworth—Economic entomology.

A. S. Hassan—Biology of the walnut blister mite (or gall mites) of the family Eriophyidae, and methods of staining for permanent mounts.

W. W. Jones—Biology of western leaf miners.

J. F. Lamiman—Biology and control of red spiders.

W. Lammerts—Life history of some gall wasps.

G. Merino—Life history of *Hippodamia convergens* (Guer.)

L. B. Soliman—A comparative study of the specific characters used in the classification of the genus *Macrosiphum* of the family Aphididae with special references to the species found in California.

Jocelyn Tyler—Experimental studies of root-knot nematodes.

D GENETICS

Prof. E. B. Babcock—Taxonomy of *Crepis* in relation to cytogenetic criteria.

(With R. E. Clausen) Genetics in relation to agriculture; revised. In press.

Prof. L. J. Collins—Genetics of certain hybrid species of *Crepis*.

Inheritance of new mutant characters in *Drosophila*.

Analysis of a tomato chimera.

Inheritance of nineteen morphological and three physiological characters in *Crepis capillaris*. Recently published.

E HORTICULTURE

S. H. Cameron—Nutrition of orange trees.

A. H. El Sawy—Effect of wounding on respiration and nutrition.

Frank E. Gardner—Effect of temperature on chemical composition of pear trees.

Y. Milad—Chlorosis in pear trees.

A. S. Mulay—Protein chemistry of pear trees.

F PALEONTOLOGY

Dr. Chas. Camp—Triassic vertebrate fauna of the southwest.

Dr. Ralph Chaney—Geology and Paleontology of the Crooked River basin.

Tertiary flora of Mongolia and Manchuria.

Dr. Bruce L. Clark—Divisions of marine Eocene of California.

The Domengine horizon: A new division of the Eocene. In press.

W. H. Schallig—Fossil beaver from the Tertiary of Nevada.

Nellie Tegland—Marine Oligocene of the State of Washington. (with particular reference to moluscs).

G PLANT NUTRITION

Prof. W. F. Gericke—Minimum salt requirements of some of the more important agricultural plants. Salt requirements at different stages of growth. Effects on growth of omitting certain salts at various growth stages.

A. S. Bean—Absorption of ammonia by plants.

D. T. Burk—Photocatalysis in solutions containing ammonia and formaldehyde in presence of various catalysts.

W. H. Schallig—The relation of potassium to the metabolism in plants.

L. J. Teakle—Absorption of phosphates by wheat plants.

Report of the National Treasurer

June 1, 1926 to January 1, 1927

GENERAL FUND

Receipts	$ 755.53
Expenditures	72.02
Balance on hand	683.50

CONVENTION FUND

Receipts	$1,421.71
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Confidence —

If an automobile manufacturer were to substitute cast iron where specifications called for steel he would have a difficult task in explaining that both belong to the same group of metals.

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